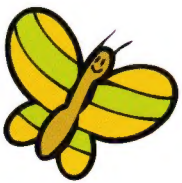
How many stages are in a butterfly's life cycle?

THE STORY OF LIFE



1 Four
2 Three
3 Two

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Butterfly

Thanks to metamorphosis, a dull caterpillar can become a colorful butterfly. The crawling insect just needs to get a complete makeover on the way!

2 There are three different stages in a butterfly's life cycle.

Photo © Molton / Jacana

After about 85 days, the hard-cased chrysalis splits and out crawls a fully grown butterfly.

Out of a very small egg comes a caterpillar, stage one in the life of a butterfly. The caterpillar eats leaves and grows very fast, shedding its skin several times as its body increases in size. Then it hangs upside down and forms a hard case, or chrysalis around itself—stage two. Inside the chrysalis, important changes are going on. Legs, antennae, and wings take form. Soon the chrysalis splits open and out wiggles a butterfly—stage three. At last the elegant butterfly spreads its wings and flies away!

Butterfly or Moth?

Butterflies and moths both start as caterpillars. Then butterfly caterpillars form hard-case chrysalis and moth caterpillars spin thick webs or cocoons. Later, they emerge as butterflies or moths. How can you tell which is which? Butterflies have thin, smooth bodies; moths have thick, furry ones. Butterfly antennae have bumps; moth antennae are feathery. Butterflies fly by day; moths fly at night.

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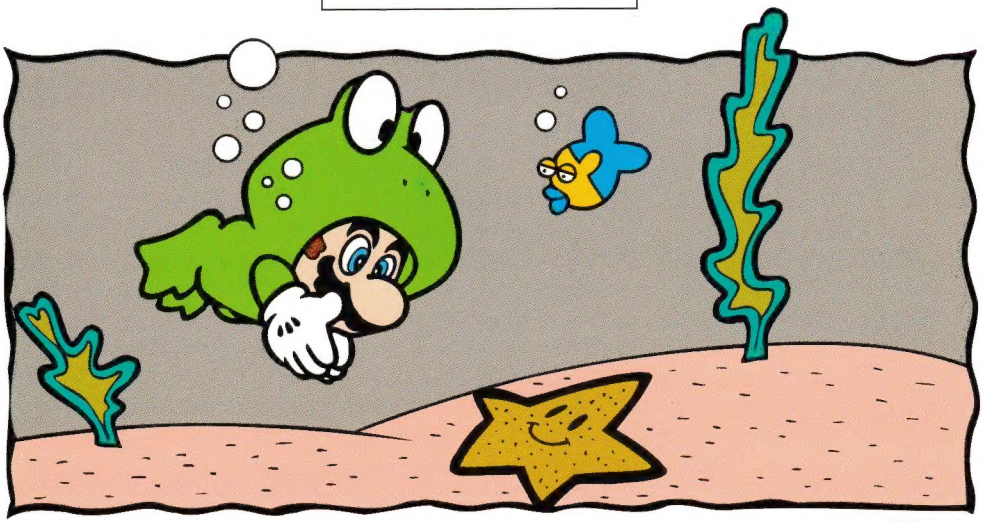
D2 491 04-17

What's the scientific name for a starfish?

THE STORY OF LIFE

1 Stellariso
2 Asterioidea
3 Galaxosea



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Starfish

The starfish is a marine echinoderm that, like its relative the sea urchin, has a soft body inside an outer skeleton. As the name suggests, a starfish or sea star has a symmetrical star-shaped shell.

2 **The scientific name for a starfish is Asterioidea.**

Photo © Y. Gladu / Explorer

Symmetrical starfish shells are a common sight on the beaches of the world.

A starfish usually has five arms extending like rays from its body. But there are exceptions. In fact, scientists have discovered starfish with as many as 20 arms! Nature has provided this marine echinoderm with a wonderful health plan—if one of its arms were to be accidentally separated from its body, a starfish could simply grow a new one to replace it!

Moving and Eating

Rows of tubed feet on the starfish's underside help the animal move. They also help the starfish catch a meal, including its favorites, mussels and oysters. After spotting a tasty oyster, for example, the starfish folds its arms over the prey, attaches its tubed feet to the shell, pulls, and forces the oyster shell open. Then the predator sucks the meaty oyster from the shell and into its mouth, also located on the starfish's underside. Finally, the oyster is digested in the starfish's two stomachs.

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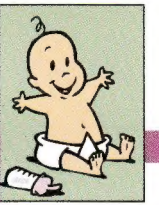
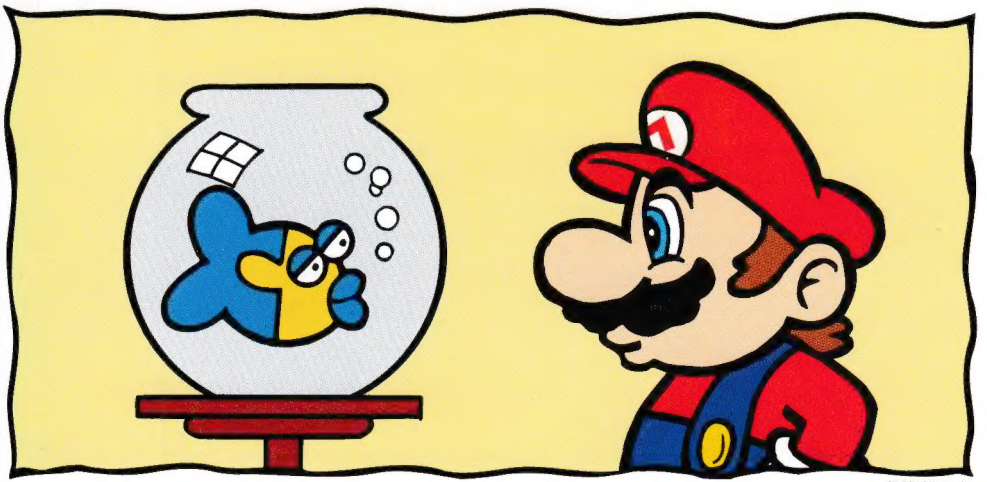
How do fish breathe?



THE STORY OF LIFE

1. Through their gills
2. Through their lungs
3. Through their skin



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Fish

Fish breathe thanks to their gills. These respiratory organs allow the aquatic animals to take in oxygen from the water and give off carbon dioxide as waste.

1 Fish breathe through their gills.

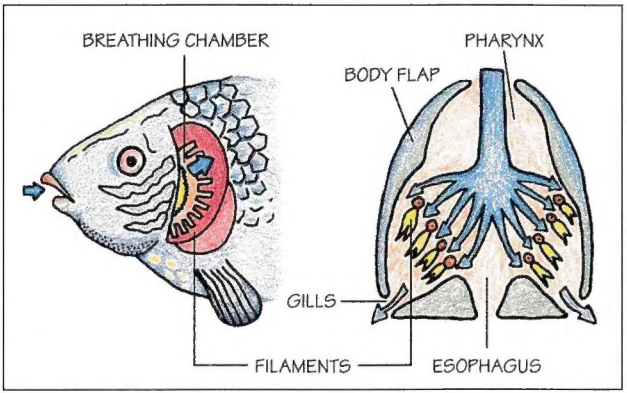

Illustration by Irene Miedzinski

Fish breathe thanks to the life-giving oxygen in the water around them.

As a fish swims along through the water, the current sloshes water into its mouth, bringing with it a supply of oxygen. The water passes by the fish's gills, its respiratory organs.

All About Gills

A fish has four gills on each side. Bony flaps protect the gills, that are arranged like the teeth of a comb. Each gill has two rows of filaments through which the water brings the oxygen, so vital for living things. The gills are thin-walled so that gases pass through easily.

The Gas Exchange

Oxygen brought into the fish's mouth by the water dissolves in the gills. It crosses a very thin lining to get into the blood. In exchange, carbon dioxide is released through the gills into the water. Then the water exits when a current, created when the bony flaps are opened, sweeps by!

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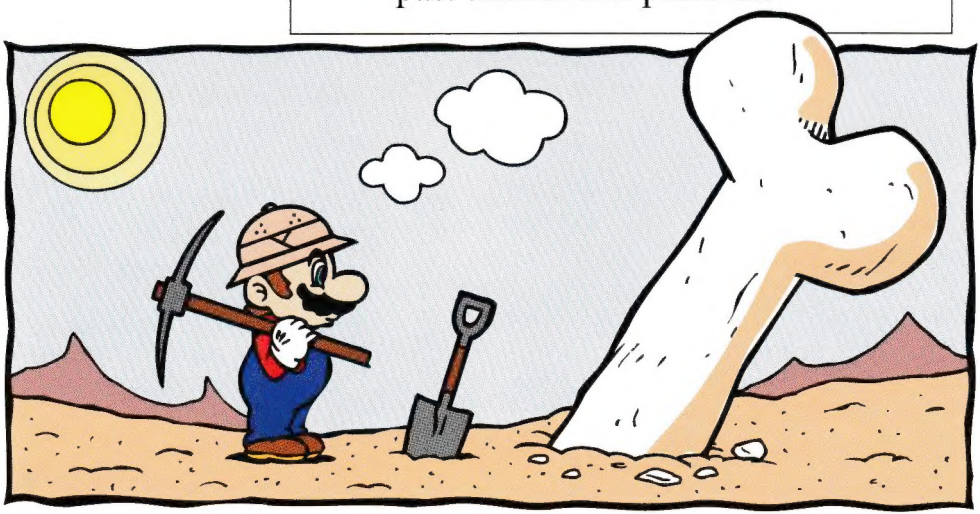
What are fossils?

THE STORY OF LIFE

1. Small carved animals
2. The metal points on ships' masts
3. Any preserved remains or prints of past animal and plant life



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Fossils

Fossils are traces of past life that have been preserved in Earth's crust. In fact, the word fossil is from the Latin *fossilis*, meaning "something dug out of the ground."

3 Fossils are any preserved remains or prints of past animal and plant life.

Photo © C. Boivieux/Explorer

Fossils can furnish precise information about now-extinct plant and animal life that existed on Earth millions of years ago.

Scientists study fossils to learn more about the organisms and the world in which they lived. Fossils may form in several different ways.

Water Works

Imagine a dinosaur died by a river. Water washed over the animal and its heavy body sank into the muddy river bed. After several million years, the river dried up and the mud hardened into rock. As the animal bones disintegrated, other minerals seeped in to fill the bone-shaped spaces. The minerals later turned to rock, creating bone fossils. As far back as 450 B.C., a Greek scientist found seashell fossils in North Africa. They were proof that millions of years earlier the region had been covered by the Mediterranean Sea.

Frozen Fossils

Sometimes an entire body is preserved. Scientists have discovered mammoths and even a human that have been buried in icy glaciers since prehistoric times!

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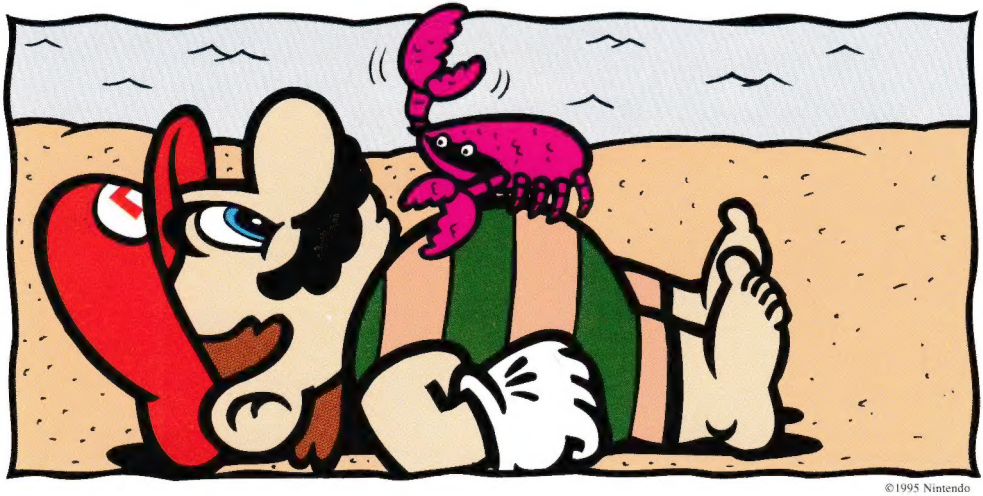
How many legs does a crustacean have?

THE STORY OF LIFE

1 Six
2 Eight
3 Ten



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Crustaceans

All crustaceans, like lobsters, shrimp, and crabs, have ten jointed legs. They also have external skeletons or shells that protect their soft bodies.

3 A crustacean has ten legs.

Photo © P. Lorne/Jacana

Crabs can capture prey hidden in the recesses of rocks, thanks to their probing pinchers.

Crustaceans molt, or shed their shells, several times before they become adults. When molting, the shell splits to allow the crustacean's soft body to come out. Molting is dangerous because the soft body is left unprotected from predators. So the crustacean hides until a new shell grows in to provide protection.

Body Segments

A crustacean's body is divided into three segments: the head, thorax, and abdomen. The animal also has sets of jointed legs. The crab, for example, has four pairs of legs for walking—something it does sideways or diagonally. It also has a pair of pinchers used to capture and hold its prey and to defend against predators. The crab uses its claws to bury itself in the sand as a means of camouflage.

There are 4,500 different species of crab. The smallest, the tiny pea crab, lives inside an oyster's shell. The largest, the giant spider crab, has a 12 1/2-ft (3.8-m) leg span!

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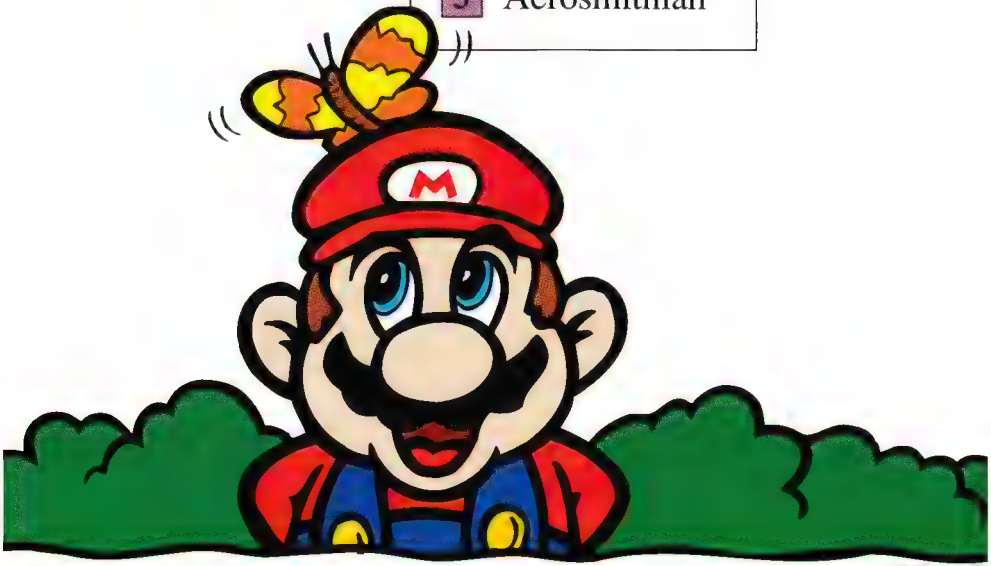
To which scientific order does the butterfly belong?

THE STORY OF LIFE

1. Lepidoptera
2. Beetlemania
3. Aerosmithian



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Butterflies

Butterflies and moths are lepidoptera, a combination of the Greek words lepis "scale" and pteron "wing." It refers to the powdery scales that cover the wings of butterflies and moths.

1 Butterflies belong to the scientific order of lepidoptera.

Photo © Basso/Jacana

The wings of tropical butterflies like this have wonderfully bright colors and some of the most beautiful patterns.

There are about 15,000-20,000 butterfly species. The largest, New Guinea's Queen Alexandr's birdwing, has a wingspan of about 11 inches (28 cm). One of the smallest, North America's western pygmy blue, has a wingspan of just 3/8 in (1 cm).

Lepidoptera Likenesses

A lepidoptera's body is divided into three parts: the head; the thorax, to which are attached six legs; and the abdomen. Its body and four wings are covered with tiny scales. In general, butterflies have colorful scales while moths are drab. The mouth of the adult lepidoptera is formed into a proboscis, a tube through which it sucks the nectar from flowers. Both butterflies and moths go through a complete metamorphosis, changing from crawling caterpillars into winged creatures.

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D2 491 06 20

To which scientific family does the jellyfish belong?

THE STORY OF LIFE

1. mollusk
2. fish
3. cnidarian

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Jellyfish

Jellyfish are not fish at all. They're marine cnidarians, a group that includes corals and sea anemones.

3 Jellyfish are cnidarians.

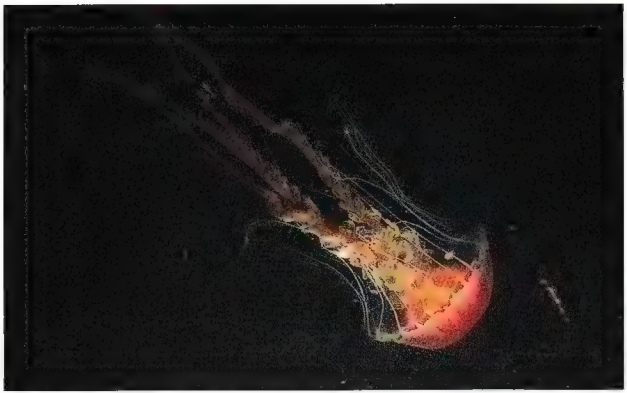

Photo © Gladu/Explorer

With tentacles trailing as it propels itself through an underwater world, a jellyfish looks somewhat like a fiery comet.

The jellyfish has no head, tail, fins, bones, heart, or brain. Its body is just a pulsating jellylike umbrella-shape with trailing tentacles—some as long as 130 feet (39 m)!

Food

To get the food they need, jellyfish and most other cnidarians use their tentacles to catch a passing meal. These boneless limbs that surround the animal's mouth are covered with poisonous cells that paralyze prey, that is then taken into the jellyfish's mouth and digested.

Movement

Cnidarians such as jellyfish move forward through their water world using a kind of jet propulsion. Rings of muscles around the edges of their parasol-like bodies contract and expand. As they contract, water is expelled backward. This in turn propels the jellyfish forward.

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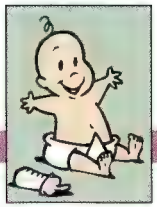
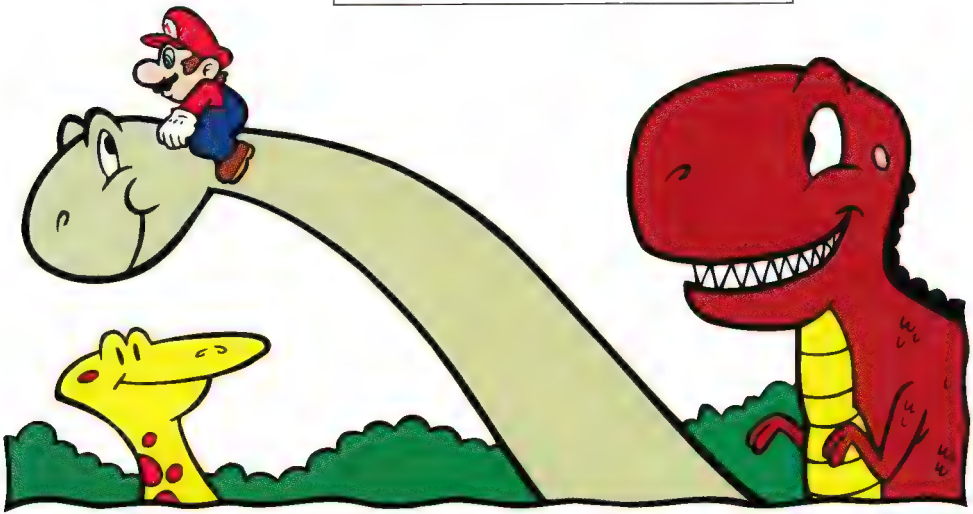
D3 491 07-14

When did the first dinosaurs appear on Earth?



THE STORY OF LIFE

1. 20,000 years ago
2. 20 million years ago
3. 220 million years ago



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Dinosaurs

Scientists say the most ancient dinosaur fossils discovered prove that the creatures were here toward the end of the Triassic Period, about 220 million years ago.

3 The first dinosaurs appeared 220 million years ago.

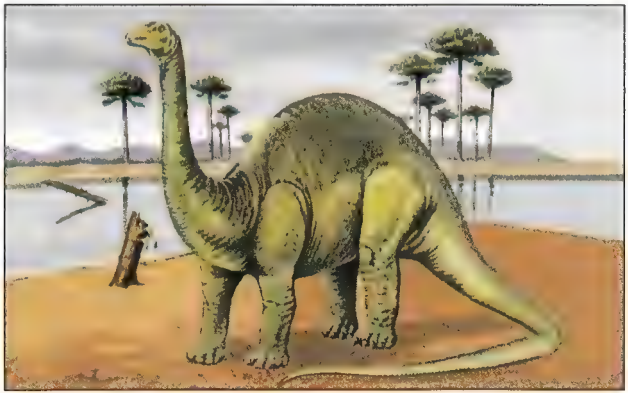

Illustration © E. Mercier

Apatosaurus was 80 feet (24 m) long and weighed more than 33 tons (30 metric tons). Herds of these peace-loving herbivores roamed regions of the U.S. during the Jurassic Period.

Scientists have identified more than 340 different kinds of dinosaurs. Not all were gigantic monsters like the ones you see on TV and movie screens. Some were as small as sparrows.

The Big One

Seismosaurus, the largest dinosaur found to date, was the Earth's largest land animal. It was more than 120 feet (36.5 m) long and weighed about 90 tons (82 metric tons). That's about the weight of 10 fully grown elephants!

All Reptiles

Dinosaurs were egg-laying reptiles. Some walked on all fours; some on two feet. Some were carnivores or meat eaters, with sharp dagger-shaped teeth. Some were herbivores or plant eaters, with blunt teeth for grinding leaves. And although some dinosaurs spent time in marshes and swamps, all of them made their homes on land.

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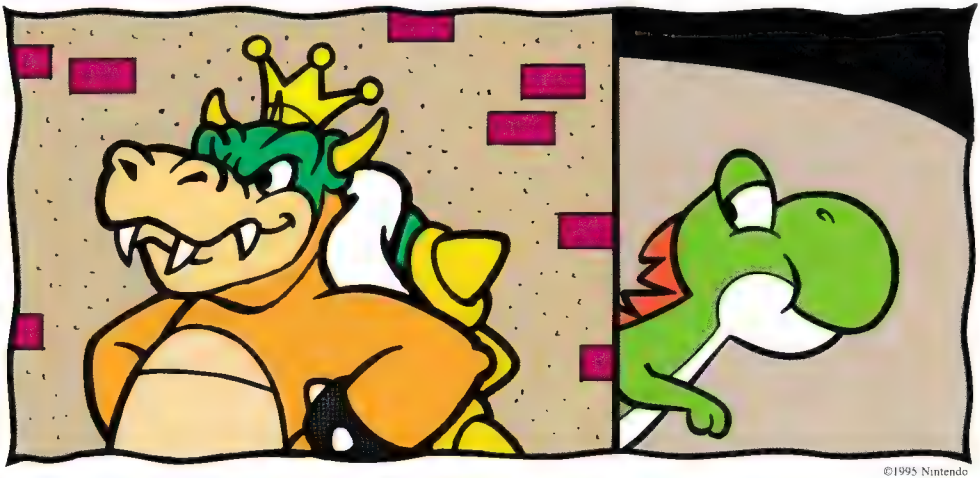
D3 054 08-01

What's a reptile?

THE STORY OF LIFE

1. An animal with 8 legs
2. An animal with stiff hair
3. An animal with dry, scaly skin



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Reptile

Turtles, snakes, lizards, crocodiles, and alligators are reptiles. They all have dry skin covered with scales, they all breathe by lungs, they all crawl, and they all reproduce by laying eggs.

3 A reptile has a dry, scaly skin.

Photo © Y. Gladu, Explorer

The color of some reptiles provides them with a natural camouflage in their environment, enabling them to "hide in plain sight" as they soak up the sun's warmth.

Reptiles are cold-blooded animals—their temperature is the same as their surroundings. So most reptiles are active by day, when it's warm, and sleep at night, when the temperature drops. In regions with very harsh, cold winters, reptiles hibernate and wait underground for the warm days of spring to arrive.

The Creepers

The word reptile comes from the Latin *reptilis,* meaning "creeping." It refers to the way the animals move, with their scaly bodies just slightly above the soil. The turtle's hard scales form a shell into which the animal can pull its head, tail, and feet if threatened. The majority of reptiles lay eggs that hatch outside the body of the female, but some snakes and lizards produce eggs that develop in the body of the mother.

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D3 054 08-10

To what scientific order does the owl belong?

THE STORY OF LIFE

1. Hootenanny
2. Strigiformes
3. Archemedia

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Owls

The order Strigiformes is separated into two families of owls: Tytonidae (barn owls) and Strigidae (typical owls). These mostly nocturnal predators are found in nearly all parts of the world.

2 The owl belongs to the order Strigiformes.

Photo © Axel / Explorer

The owl swoops down silently on its prey. The mouse never heard it coming!

Owls have large heads with short hooked beaks, hooked and feathered talons, and large eyes set in a facial disk. Their eyes are remarkably powerful—100 times more sensitive than a human's!

Night Hunter

Aided by its very keen hearing and eyes that adapt well to the darkness, the owl is an expert hunter. Its fluffy feathers allow the bird to soar silently through the night sky in search of prey. It feeds on small mammals, birds, and insects.

Home Life

Some owls live in dark, wooded areas where they might never be seen by humans. Others, like the screech or barn owl, don't mind human neighbors. They may nest in the hollows of trees, in attics, or in old buildings and barns. You are most likely to see or hear owls at dusk.

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D3 054 09-02

Do all birds build nests in trees?

1 No, the location of a nest varies according to the species.

2 Yes, all birds nest in the hollow trunks or the branches of trees.

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Bird Nests

Some birds build nests in trees, others on the ground, walls, or rocky mountain ledges, in barns, or under roofs of houses. And some don't build nests at all.

1 **No, the location of a nest varies according to the species of bird.**

Photo © Varin-Visage / Jacana

A flamingo chick could leave the nest after three or four days.

Placement of a bird's nest is carefully chosen. It must offer the best protection for the eggs and against the weather and enemies.

Perched Nests

Birds hatched in perched nests, like the sparrow in a tree or the eagle on a mountain ledge, start life without feathers and with their eyes closed. Parents protect the chicks from falling before they're ready to fly by hunting for food and bringing it to them. They develop quickly—their weight could multiply by ten in just ten days! Then they're strong enough to try their wings.

Ground Nests

Birds hatched on the ground, like seagulls and ducks, are more developed, covered with down, and leave their nests immediately to follow their parents. These chicks very quickly learn to find their own food.

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D3 054 09-09

What animal do scientists believe is the ancestor of all birds?

THE STORY OF LIFE

1. Gallimimus
2. Ornithomimus
3. Archaeopteryx

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Archaeopteryx

Scientists say Archaeopteryx lived 140 million years ago, in the late Jurassic Period, along with dinosaurs. This crow-sized creature, whose fossils have been recovered, is believed to be the link between reptiles and birds.

3 Scientists believe Archaeopteryx is the ancestor of all birds.

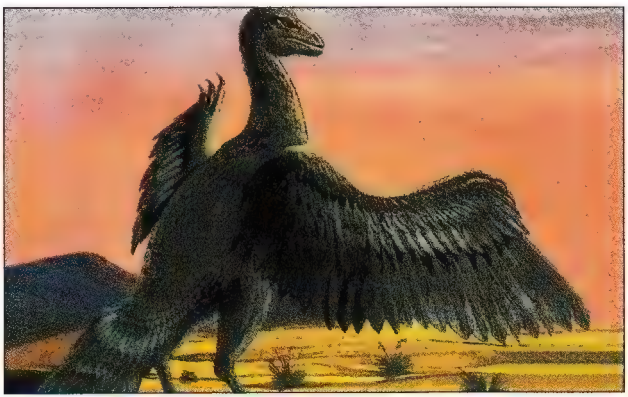

Illustration © J. Simon

Archaeopteryx resembled both reptiles and modern birds.

Archaeopteryx had a skeleton like a reptile's and resembled small dinosaurs, but it had fully developed feathers and wings like a bird. This unusual creature also had teeth, a long tail, resembling a lizards, covered with feathers, and three "fingers" with claws on its wings. Experts think the claws were used to climb trees. Its outstretched arms formed wings. Most likely, Archaeopteryx was an excellent glider and could possibly fly.

Missing Link

The dinosaurs disappeared more than 60 million years ago. Since then birds have slowly evolved. Today, there are over 8,500 species of birds. How did this change from dinosaur to present-day bird happen? Scientists are still looking for the answer.

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D3 054 10-01

How do snakes swallow their prey?

THE STORY OF LIFE

1. They grind it with their teeth.
2. They soften it with saliva.
3. They swallow it whole.

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Snakes

Snakes are carnivores, or meat-eaters. Some may poison or constrict their prey to capture it, but they all swallow their prey whole, without chewing it.

3 Snakes swallow their prey whole.

Photo © Hug / Explorer

A snake can swallow an animal that's more than twice as big as its head!

Snakes have forked tongues covered with sense organs. The animals flick their tongues in and out of their mouths to help them find food. They feed on insects, eggs, rodents, and other larger mammals, and always swallow their prey whole. Snakes can swallow prey larger than their heads because their upper and lower jaws spread very wide and can move separately. A python can swallow a 130-pound (59-kg) gazelle and an anaconda can swallow a 99-pound (45-kg) pig!

In Digestion

The swallowed prey progresses into the snake's digestive tube, thanks to magnificent muscle movements and the suppleness of the snake's skeleton. There, very strong digestive juices break down and liquefy the meal, right down to the bones.

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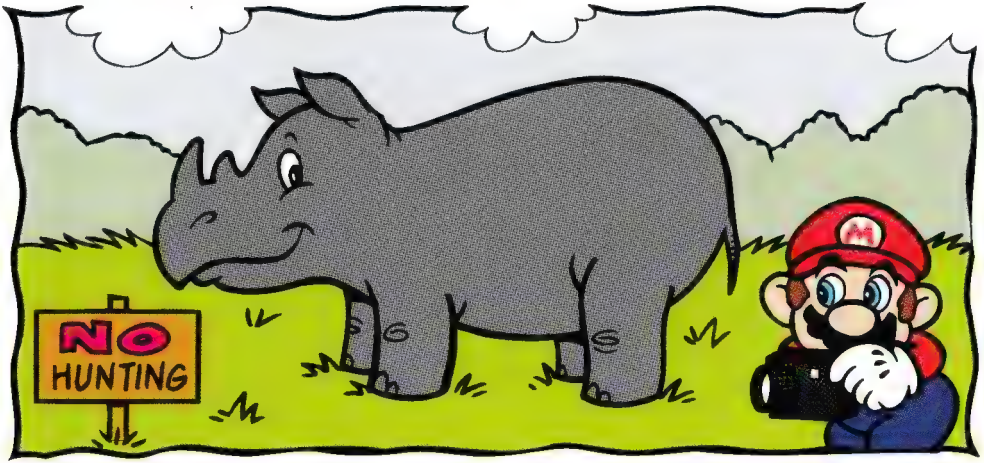
D3 054 10-03

Why is the rhinoceros endangered?

THE STORY OF LIFE

1. A rare disease is killing them.
2. Illegal hunters are killing them.
3. They have run out of food.



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Rhinoceros

The rhinoceros is in danger of extinction because of poachers. Although it's against the law to kill a rhino in Africa, poachers break the law to get rhino horns.

2 Rhinos are endangered because poachers, or illegal hunters, continue to kill them.

Photo © Arthus-Bertrand / Explorer

If the killing continues, experts say the wild rhino will become extinct by the end of this century, and will only be seen in zoos.

The black rhino, actually grayish-brown in color, and the white rhino, a pale gray color, are both endangered. But the black rhino is at greater risk. About 20 years ago, there were more than 65,000 of them in Africa. Since then, poachers have killed almost 90 percent of the black rhinos, so that today there may only be a few thousand left. Experts say if the killing doesn't stop, the black rhino will become extinct in the wild.

Horns of Plenty

Poachers sell rhino horns for lots of money—in some places one is worth $5,000 to $15,000. The horns may be carved into dagger handles. Or in some parts of Asia, where people believe rhino horns have magical powers, they may be ground up and used in medicines believed to combat fever, headaches, heart problems, and snake bites.

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D1 054 12-14

What is a quill?

THE STORY OF LIFE

1. A British half-dollar
2. A type of bird feather
3. A small blanket

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Feathers

Birds have several kinds of feathers, including the long quills on their wings and tails. Each type of feather serves a specific purpose.

Feathers are hard outgrowths of a bird's skin. They're made of a protein, called keratin, that's also found in human fingernails.

What Feathers Do

Feathers provide a bird with insulation and help it fly. Long wing quills are very strong and allow the bird to flap its wings to gain flight. Tail quills act as a rudder to help the bird steer and change direction in flight. And fluffy down feathers all over the bird help retain its body heat. A bird sheds its feathers and grows new ones at least once a year. This process is called molting.

2 A quill is a type of bird feather.

Photo © Varin-Visage / Explorer

By angling its long quill feathers, the bird directs the airflow to lift it into flight and to allow it to land gently.

Flying Facts

Wing-flapping takes great muscular effort, but a little flapping allows a bird to glide effortlessly when it wants to. With wings extended and rigid, the bird soars in circles using the force of rising warm air. When wind currents are just right, a bird can rest in flight for hours… even days. Marine birds, like seagulls, are excellent gliders. So are some land birds, such as swallows, eagles, and falcons.

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D3 054 13-07

What do ladybugs and June bugs have in common?

THE STORY OF LIFE

1. Both are beetles
2. Both have spots
3. Both have eight legs

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Beetles

Unlike other insects, adult beetles have special front wings with leather-like covers that protect their bodies. Because of their shell-like skeletons and hard wing covers, beetles are considered the "armored tanks" of the insect world.

1 **Both the ladybug and June bug are beetles.**

Photo © Collobert / Jacana

In fall, ladybugs gather in large numbers to hibernate under leaves at the base of trees, under stones, or under the eaves of houses.

There are about 300,000 species of beetles—they make up the largest segment of the insect world. Beetles live everywhere in the world, except in the ocean. They thrive in forests, deserts, icy cold places, hot springs, mountain lakes, and even polluted sewers.

Beetle Habits

Some beetles are big, like the African Goliath beetle that's about 5 inches (13 cm) long. Others are less than 1/50 of an inch (0.5 mm) long. Some beetles such as June bugs and Japanese beetles eat plants. Others eat insects and are helpful to plant growers—ladybugs, also known as ladybirds, eat insects that attack trees, shrubs, and crops. There are more than 4,000 species of black-spotted ladybugs.

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D3 054 14-03

Do all living beings come from eggs?

THE STORY OF LIFE

1. Yes, an egg is necessary for the beginning development of a living being.
2. No, only birds and fish come from eggs.

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Eggs

The life of an animal, including the human animal, starts with the meeting of a male cell (sperm) with a female cell (egg). The meeting fertilizes the egg and starts the development of a new being.

1 Yes, all living beings develop from eggs.

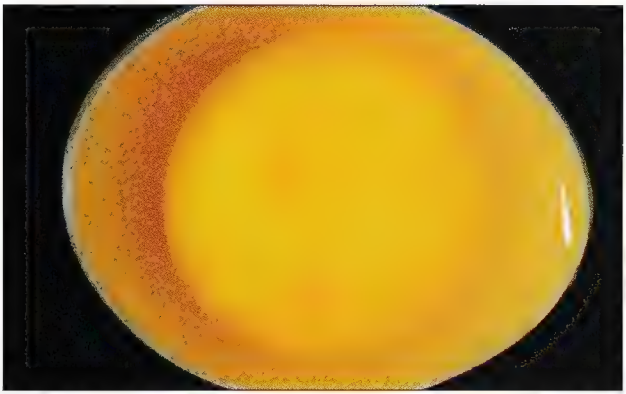

Photo © J. M. Labat / Jacana

Inside this hen's egg:, the yolk or yellow will supply ample food for a growing chick.

During the normal development of a fertilized egg, the cells divide again and again, finally creating a living being. Like all cells, the egg has a core surrounded by a membrane. During development, parts of the egg supply food to the young being as it grows. When it is finally born or hatched, the new living thing is composed of billions and billions of cells, and is a member of the same species as its parents.

Inside or Out?

In many species, like birds, fish, insects, and spiders, the female lays her eggs and her young develop outside of her body. In mammals, such as humans, whales, horses, cows, and bears, the egg develops in the body of the female and her young are born live. A few mammals, like kangaroos and pandas, bear their young live but then allow the tiny embryos to develop further outside their bodies.

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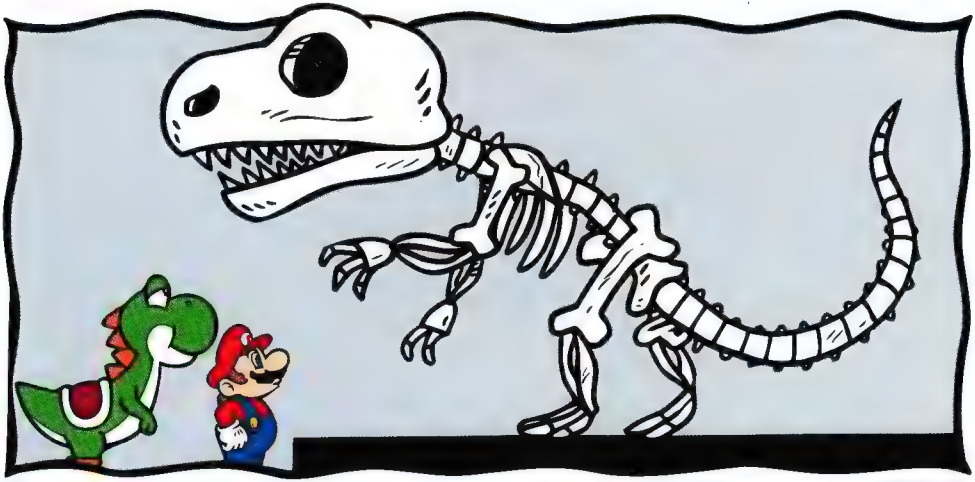
When did dinosaurs become extinct?

THE STORY OF LIFE

1. 65 million years ago
2. 120 million years ago
3. 185 million years ago



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Dinosaur Extinction

No one knows exactly why dinosaurs became extinct… except the dinosaurs, and they're not talking! But scientists have some theories.

1 **Scientists say the dinosaurs disappeared about 65 million years ago.**

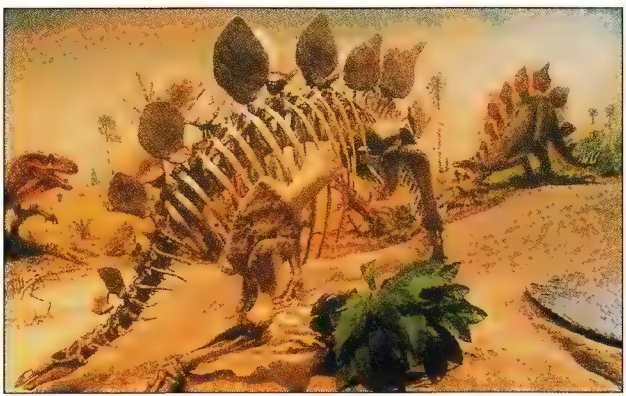

Photo © S. Rasmussen / Spa Icono

Paleontologists reconstruct dinosaurs, like this Stegosaurus, from fossils to learn how they looked, moved, and lived.

Some scientists believe a huge meteorite crashed into Earth 65 million years ago, creating a dust cloud that blocked the sun's rays. Without sunlight, plants couldn't grow. Plant-eating dinosaurs starved to death, followed by the meat-eaters, who would have preyed on the plant-eaters. Other scientists believe the meteorite set off worldwide fires, whose smoke blocked the sun's rays, causing plants and dinosaurs to die.

Weather Wise

Other experts say changes in Earth's climate caused the extinction. Water dried up and plants died, as did the dinosaurs. Another scientist believes a dinosaur's sex was decided AFTER the egg was laid. Hotter weather caused more males than females to develop. Soon only males hatched and dinosaurs became extinct! This theory satisfies people who point out that other animals, including small mammals, survived when dinosaurs became extinct.

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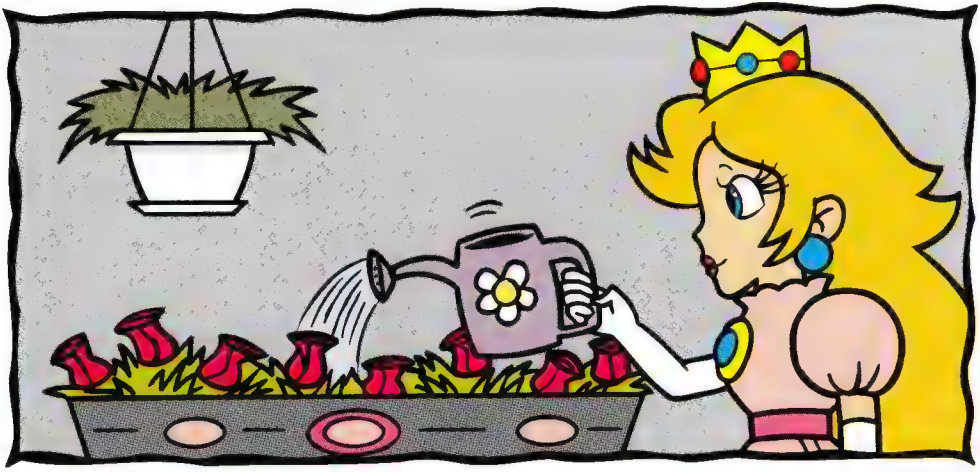
When did plants first appear on Earth?

THE STORY OF LIFE

1. About 10 billion years ago
2. About 3 billion years ago
3. About 2 million years ago



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Plant Life

The oldest plant fossils discovered are bacteria and blue-green algae. Scientists say the plants grew on Earth about 3 billion years ago.

2 Scientists say the first plants appeared on Earth about 3 billion years ago.

Photo © Overseas-Villarosa / Jacana

Scientists study fossils, like this blue-green algae fossil, to learn how the plant kingdom developed on Earth.

Plant life has gone through many changes over time. Like animals, plants had to compete for sunlight, food, and water. Some grew and reproduced better than others. Over time they developed to adapt to changes in the environment. Those that couldn't adapt have become extinct.

Plant Progression

The first land plants, with sticklike bodies but no leaves or roots, appeared on Earth over 430 million years ago. Later, mosses and mushrooms grew in abundance. Over the next few million years, more complex plants like trees, ferns, and horsetails appeared. Then came flowers, grains, conifers, tubers, and cacti. Today, there are thousands of species of plants, including the two that started it all so long ago—bacteria and blue-green algae!

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What is coral?

THE STORY OF LIFE

1. A marine plant
2. A marine animal
3. A rock formation

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Coral

Despite its plant-like appearance, coral is a limestone structure formed by millions of tiny sea animals called polyps. The creatures that form coral belong to the same animal group as jellyfish and sea anemones. They live in colonies mostly in warm tropical seas.

2 Coral is a marine animal.

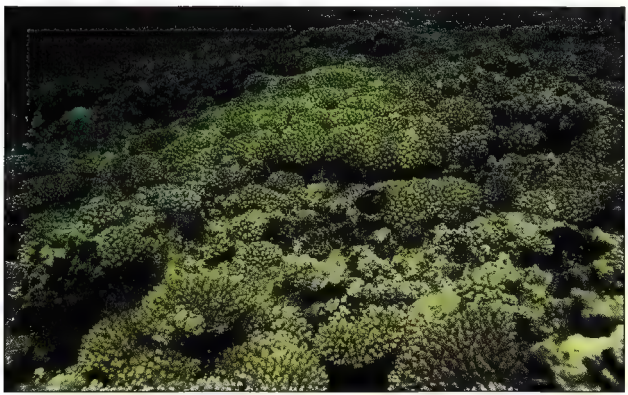

Photo © Suvarof / Explorer

Formations of coral may look like large domes, branching trees, or flowering plants, but they're living animals.

Most coral polyps are less than 1 inch (2.5 cm) in diameter, but a few measure as much as 1 foot (30 cm) across. A polyp's body is cylindrical, with a mouth at one end, surrounded by small tentacles. If prey lightly touch them, the tentacles guide it into the mouth. The polyp's other end anchors it to hard surfaces.

Reefs

Coral polyps take calcium out of the sea water, then secrete calcium carbonate (limestone) "skeletons" after attaching to one another. When the animals die, they leave behind their limestone skeletons that form the foundation of barriers called coral reefs. Australia's Great Barrier Reef, about 1,250 miles (2,010 km) long, is the world's longest coral reef.

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Which is the smallest particle of living matter?

THE STORY OF LIFE

1. The cell
2. The nucleus
3. The chromosome

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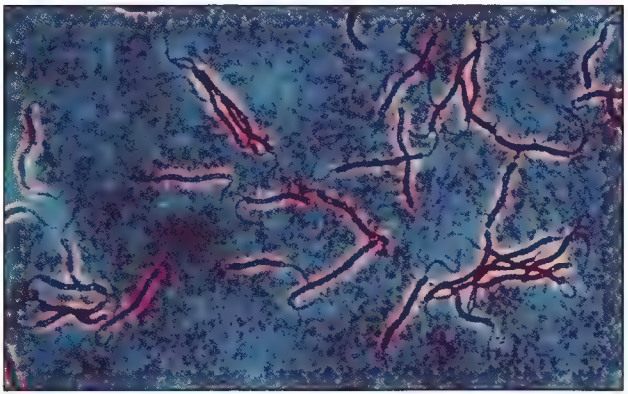
Cells

A cell is basic unit of living matter from which all plants and animals are built. This tiny part of an organism can carry out all the functions necessary for life.

1 The cell is the smallest particle of living matter.



© M Abbey-Reséa / Explorer

Bacteria and protozoa have only one cell, but other living things have millions of cells.

Cells are the building blocks of every living thing (except viruses). Some plants and animals, like the amoeba, have only one cell. Everything else has two or more cells. The human body is made up of more than 10 million million (10,000,000,000,000) cells!

Cells and Their Roles

Nearly all cells contain three parts: a clear fluid called cytoplasm, a nucleus or core; and an outer membrane or wall. Each cell plays a part in life. The first cell divides, producing other cells that in turn multiply by splitting. Specialized cells create skin, muscles, nerves, or tissue. Many tissue cells together build a body organ. Cells continue to multiply throughout your life, helping you grow and develop, and replacing dead cells with fresh new ones.

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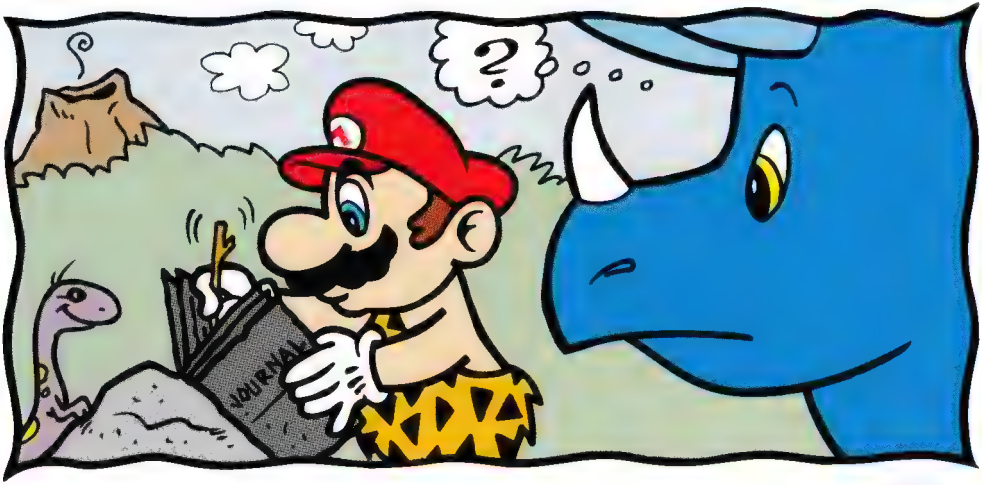
What does “prehistoric” mean?

THE STORY OF LIFE

1. Before the Age of Dinosaurs
2. Before the invention of television
3. Before written records were kept



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Prehistory

Scientists say the first humans appeared on Earth about 2 million years ago. But people didn't keep written records until about 5,500 years ago. Everything that happened before that is called "prehistory."

3 Prehistoric means before written records were kept.

© Ch. Lenars / Explorer

Prehistoric paintings, drawn by Ice Age people in about 15,000 B.C., cover the walls of Lascaux Cave near Montignac, France.

History, starting with the development of writing, was preceded by an immense period of time. Archaeologists study clues from prehistory to learn what the world and its inhabitants were like.

Rebus Records

Ice Age cave paintings, like the one pictured here, help us find out about the past. These picture messages tell wordless stories about prehistoric people, but need to be interpreted. For example, experts say animals in the paintings may represent prey, but why they were drawn on this wall is still unknown. Was this a home in which the owner recorded all animals killed? Or was this a place of worship and the pictures were like prayers asking for a good hunt? Only prehistoric people know for sure, and they couldn't leave a note to explain things!

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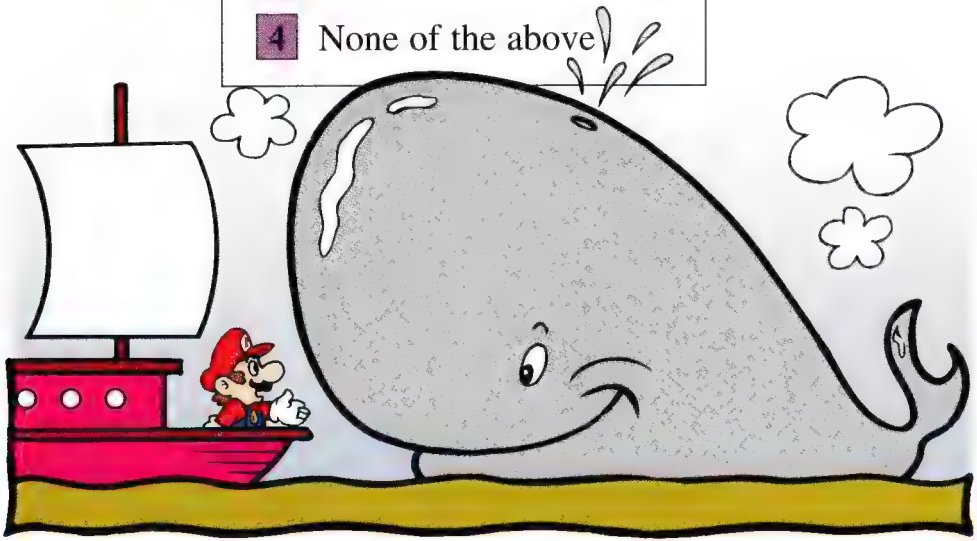
Which are cetaceans?

THE STORY OF LIFE

1. Whales and dolphins
2. Oysters and clams
3. Kangaroos and koalas
4. None of the above



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Cetaceans

There are 75 different species in the biological order Cetacea. These mammals fall into two groups: those without teeth such as the blue and gray baleen whales and those with teeth such as beluga whales and dolphins.

1 Whales and dolphins are aquatic mammals called cetaceans.

© Ocean Images / Sipa Press

An enormous humpback whale breeches, or leaps from the water, and lands on its back before going underwater again.

Instead of teeth, baleen whales have hundreds of thin plates hanging from their upper jaws. The plates, or baleen, are made of the same type of material as human nails. On the inside edge of each plate are brushlike fibers that filter out food from the water. Baleen whales feed mainly on plankton—microscopic sea animals and plants. As the whale swims, water and plankton enter its mouth. Like a sieve, the baleen keeps the food inside and lets the water drain out.

Toothed Whales

Nearly all species of toothed whales have peglike teeth growing up from their lower jaws. Some also have teeth in their upper jaws. Some toothed whales eat squid and cuttlefish and others eat only fish—the sperm whale will eat barracuda or shark.

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Are the llama and camel related?

THE STORY OF LIFE

1. No, each is from a different animal family.
2. Yes, both are from the same family of Camelidae.
3. Yes, both are llamatos.

©1995 Nintendo

Camels

The llama and camel are even-toed, hoofed ruminants—animals that chew their cuds and have stomachs with multiple chambers. The camel comes from the Old World—the Eastern Hemisphere—and the llama from the New World—the Western Hemisphere.

2 The llama and camel are from the same family of Camelidae.

© NHPA / Sunset

These South American alpacas are prized for their wool.

There are two Old World camels: the two-humped or Bactrian camel, used to carry heavy loads across the deserts of Asia Minor; and the one-humped dromedary or Arabian camel of North Africa and the Middle East. Both camels' humps contain fatty tissue that stores water, allowing the camels to go a long time between drinks.

New World Camelidae

The llama, guanaco, alpaca, and vicuña are New World members of the family from South America. These creatures don't have humps, but do have long legs and necks, short tails, small heads, and large pointy ears. And, like their Old World relatives, they spit when they're angry!

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How many insect species exist?

THE STORY OF LIFE

1. Less than 65,000
2. About 250,000
3. At least 1,000,000

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Insects

There are more species of insects on Earth than of all other animals combined. Scientists have identified about 1 million insect species and estimate there are 10-30 million species undiscovered!

3 **Scientists say there are at least 1 million species of insects in the world.**

© Goetghluck / Sunset

The praying mantis, a carnivore, eats other insects. In fact, the female usually devours the male after mating.

An insect secretes an external skeleton, or exoskeleton, of thick hard cuticle containing substances to waterproof its body. The body has three regions: head, thorax, and abdomen.

Identifying Insects

On the head are eyes, antennae, mouth, and special mouth parts, like a butterfly's proboscis for drinking nectar or a cockroach's jagged pincers for crushing and chewing. The eyes and antennae are covered with tiny hairs that sense smell and taste. The thorax has three sets of legs, identifying the animal as an insect, and usually two pairs of wings.

Growing and Changing

As most insects grow, they shed the exoskeletons after making new, larger ones inside the old ones. At first, the new skeletons are soft and stretchable, then they harden in the air.

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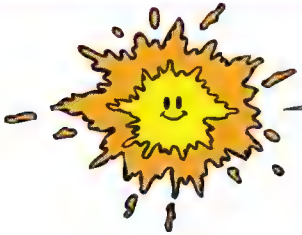
Which is a monotreme?

THE STORY OF LIFE



1. A kangaroo
2. A platypus
3. A koala

Illustration: Gary Fields

©1995 Nintendo

Platypus

A duck-billed platypus is a monotreme, an egg-laying mammal. There are only two living monotreme species: the platypus and echidna, or spiny anteater. Both live in Australia and Tasmania.

2 A platypus is a monotreme, a mammal that lays eggs outside its body.

© G. Lacz / Sunset

The duck-billed platypus is a protected species. If it were to become extinct, we soon might have no monotremes at all.

The platypus has webbed feet and thick fur to equip it for life in the water. Its flat tail acts like a rudder as the platypus swims with its toothless, bill-like mouth open to snatch crustaceans and insects from the water's surface.

Ancient Animal Species

Zoologists say there once were many monotremes on the supercontinent Gondwanaland. But about 200 million years ago, the supercontinent began to break up. Australia became isolated from Gondwanaland, where monotremes were replaced by placental mammals that give birth to live offspring. Eventually, the rest of Gondwanaland broke apart, leaving placental animals on all of Earth's continents except Australia. When Tasmania was formed, it became the only other place to have monotremes.

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How many species of mammals exist?

THE STORY OF LIFE

1 20,000
2 12,000
3 4,000

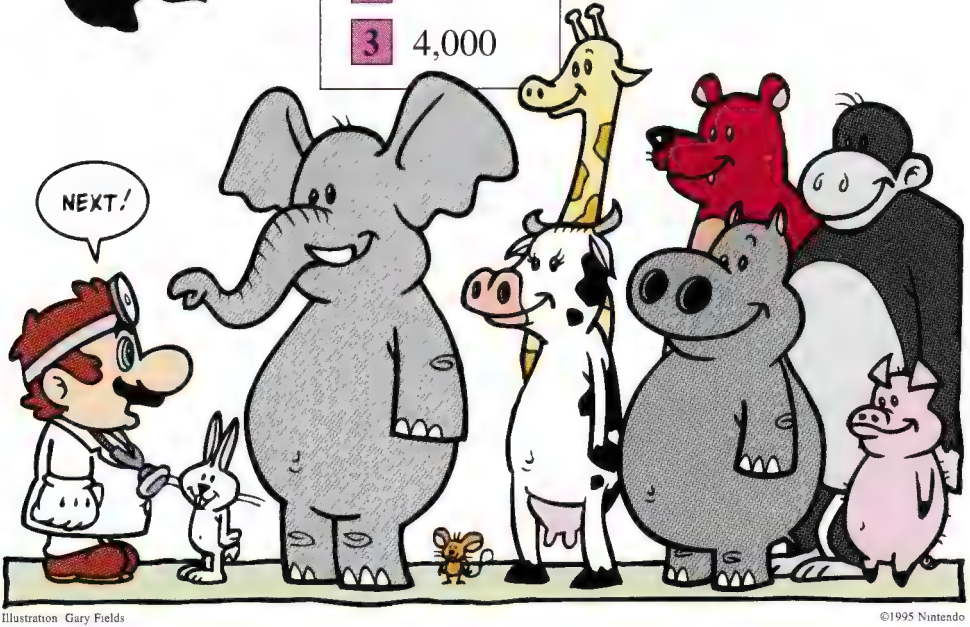

Illustration Gary Fields

©1995 Nintendo

Mammals

Humans belong to the biological class Mammalia, or mammals. Mammals are warm-blooded, have spines, and almost all give birth to live babies which are weaned on milk from the mother.

3 There are about 4,000 species of mammals on Earth.

© G. Lacz / Sunset

Offspring of marsupials, such as kangaroos, develop in a pouch outside the mother's body.

We mammals are a diverse group, ranging from aquatic mammals (whales) to flying mammals (bats). Almost half of all species of mammals are rodents, such as mice, rats, squirrels and porcupines. Most mammals walk on four legs. Some, like humans and kangaroos, get around on two. And others, like seals and manatees, don't really have legs at all. Strange as it seems, some mammals, like the platypus, even lay eggs.

Marvelous Marsupials

While most mammals give birth to fully developed offspring, marsupials do not. They're the animals, like kangaroos and opossums, that carry their babies in pouches. When marsupial babies are born they're not fully formed. They complete their development in the pouch outside the mother's body.

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Who proposed the theory of natural selection?

THE STORY OF LIFE

1. Charles Darwin
2. Gregor Mendel
3. John James Audubon

Illustration Gary Fields

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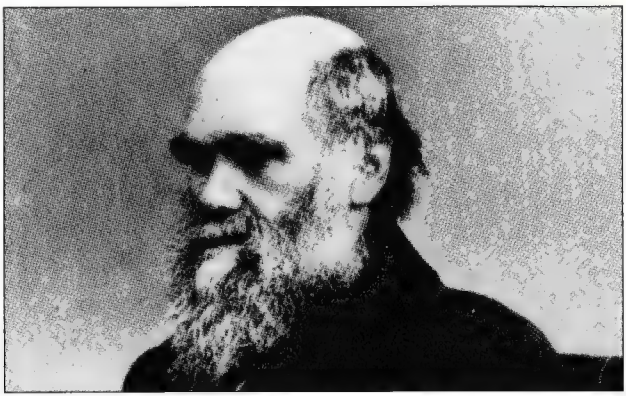
Charles Darwin

English naturalist Charles Darwin (1809-1882) believed that all plants and animals evolved from earlier species. He wrote about his theory in *The Origin of Species* (1859).

1 Charles Darwin proposed the theory of natural selection.



© VIP / Sipa Icono

Darwin explained differences between individuals of the same species as a combination of inherited characteristics and adaptation to natural surroundings.

Darwin said plants and animals adapt to their surroundings. Weaker members of a species eventually die out and only stronger members—those best able to find food and combat enemies and disease—live to breed future generations. From this we get the phrase "survival of the fittest."

Voyage of the Beagle

Darwin sailed around the world to study plants and animals in his ship, the HMS Beagle. In the Galapagos Islands in South America, he studied finches. He noticed that, even though they all belonged to the same species, their beaks differed depending on the type of food they ate. Over time, the birds had naturally adapted to their surroundings.

A Controversy

Darwin's theories of natural selection and evolution, caused a social revolution because they contradicted the biblical story of creation. It took years for his ideas to be widely accepted and taught in schools.

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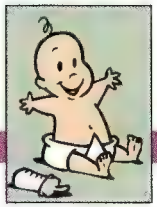
What is camouflage?



THE STORY OF LIFE

1. The national flag of Cameroon
2. The lens on a camera
3. Protective coloration

Illustration: Gary Fields

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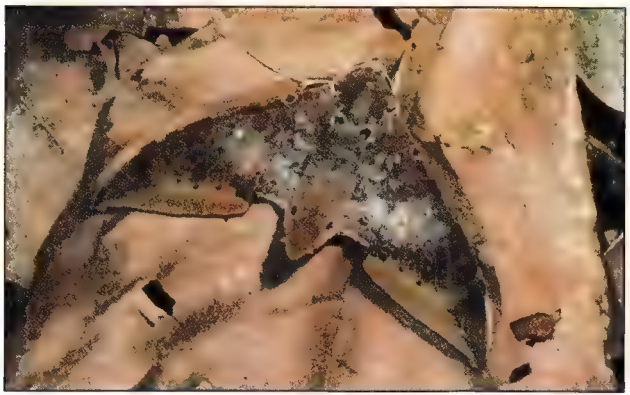
Camouflage

Camouflage seems to make animals disappear in their surroundings. It allows them to "hide in plain sight," but only if they stay perfectly still until the danger is gone.

3 Camouflage is protective coloration.



© Geoghehuck / Sunset

It's difficult to see this sphinx moth on a tree whose bark has the same colors.

A sand-colored fish living deep in the ocean is hard to see, nestled quietly on the sand. A moth like the gray bark crypsis is tough to spot when it's resting on a gray-barked tree. And just try to locate a brown toad on brown soil! But sometimes camouflage helps the predator: a polar bear is almost invisible on snowy ground and in tall yellow-brown grass on a savanna, a tawny lion can wait unseen for prey.

More Means of Defense

Every animal has a means of defense. Some use camouflage, some play dead, some have armored shells, some give off unpleasant odors, and some have sharp quills. Others have what's called protective resemblance: they're shaped like something else. For instance, some leaf-eating insects look like thorns or other parts of the plants on which they prey.

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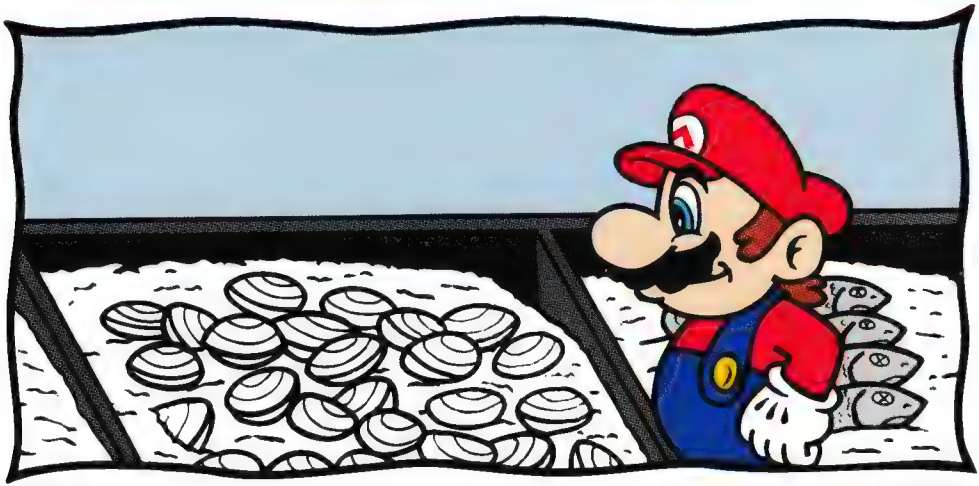
Which are mollusks?

THE STORY OF LIFE

1 Snails
2 Shrimp
3 Lobsters



Illustration, Gary Fields

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Mollusks

Mollusks have soft, boneless bodies. Some, like clams, snails, and oysters, have external shells into which their bodies can retreat.

1 Snails are mollusks.

© C. Roessler / Sunset

There are about 100,000 kinds of mollusks, and about 1,000 new species are discovered each year.

Most mollusks have shells to protect their soft bodies. But some, like squid and cuttle fish, grow shells inside their bodies —pens in squids and cuttlebones in cuttle fish. Other mollusks, like slugs and octopuses, have no shells at all.

All Have Mantles

Every mollusk has a skin-like part called a mantle. In a shelled mollusk the mantle secretes liquid, creating the shell and regularly adding to it as the animal grows. In a non-shelled mollusk, the mantle is a tough cover around body organs.

Mollusk Facts

Mollusks live in most parts of the world—in oceans, on mountain slopes, and in deserts. All must keep their bodies moistened or they'll die. Land mollusks live in the soil or under leaves in damp places. Humans enjoy many species of mollusks as a food source. Mollusk shells are used for making buttons and jewelry.

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Are all birds' beaks alike?

THE STORY OF LIFE

1. Yes, they are all used in the same way.
2. No, bird beaks vary.

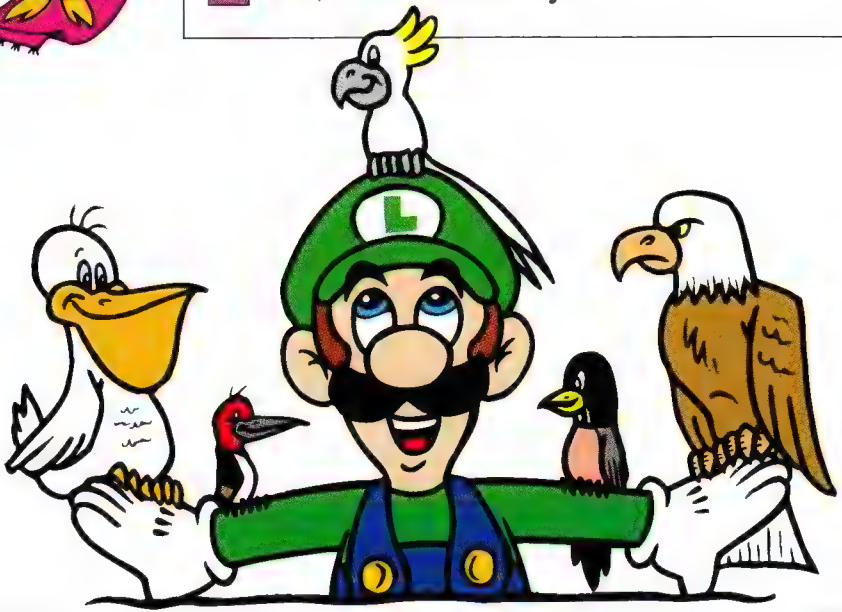

Illustration: Gary Fields

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Beaks

Different birds eat different kinds of food, and they get their food in different ways. So the shape and size of birds' beaks, or bills, vary, depending on how they're used.

2 No, all bird beaks are not alike; they vary depending on their use.

© Animals / Sunset

Each bird has a beak that's just right to help that bird get food and feed its young until they can hunt for food on their own.

A woodpecker's sharp chisel-shaped bill is just right for drilling holes in trees to get insects living inside. The hummingbird's long needle-shaped bill is perfect for poking into tube-like plant parts to get nectar. And a whip-poorwill has a wide beak so the bird can catch insects in mid-air. A pelican sweeps its bag-like beak through the water to scoop up fish. A seed-eating finch has a hard, cone-shaped bill to crack seeds and nuts. And a duck's broad bill has hundreds of tiny filters along the edges to filter out food particles and let the water drain out, like a baleen whale does.

Meat-Eaters

Birds of prey usually have sharp hooked bills to tear and rip their preys' flesh. And most fish-eaters have long pointy beaks to stab their prey.

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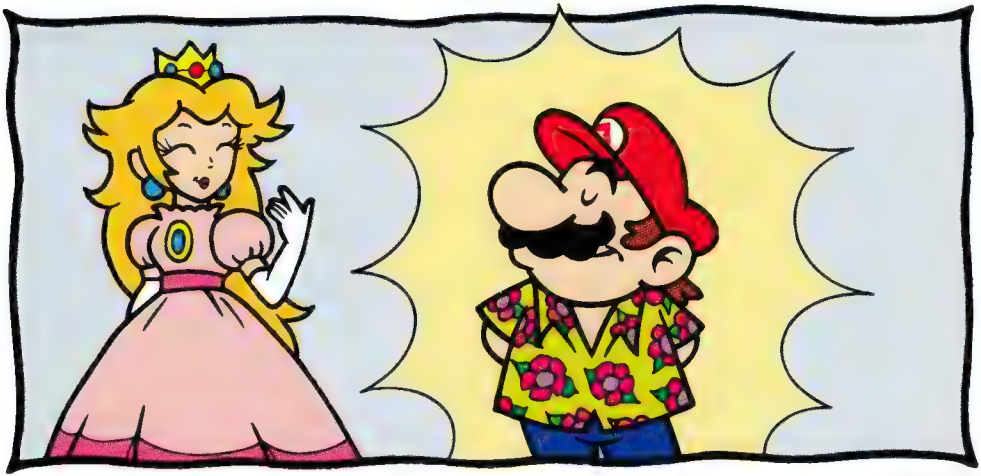
Why in some species are the females less colorful than the males?

THE STORY OF LIFE

1. So males can hide from predators.
2. So females are less noticeable to predators.



Illustration, Gary Fields

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Animal Coloration

The females of some animal species have less colorful fur, feathers, or skin than the males. This makes the females less noticeable to predators while nesting or teaching their young.

2 In some species females are less colorful so they'll be less noticeable to predators.

© G. Lacz / Sunset

This female, with her less noticeable feathers, could blend into the environment while on her nest. The brighter male is easy to spot.

The difference in coloration between male and female is quickly seen in birds. Subdued colors protect the female, while the male's brighter colors help it attract females or frighten off rivals.

Fancy Feathers

A male peacock's beautiful tail is a good example of display coloration. The bird opens its fan-like tail feathers to attract a mate or ruffles them to threaten a rival. Look at a pair of mallard ducks and it's easy to spot the male with his colorful bands and wing patches. And a tom turkey has a colorful head crest and wattle. The bright colors make males easy to spot, so most don't help care for their families. If the male is spotted and killed, at least the female and young are safe. Many males can hide their colorful plumage under outer feathers.

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Which underground creature cannot see or hear?

THE STORY OF LIFE

1. Mole
2. Potato bug
3. Earthworm

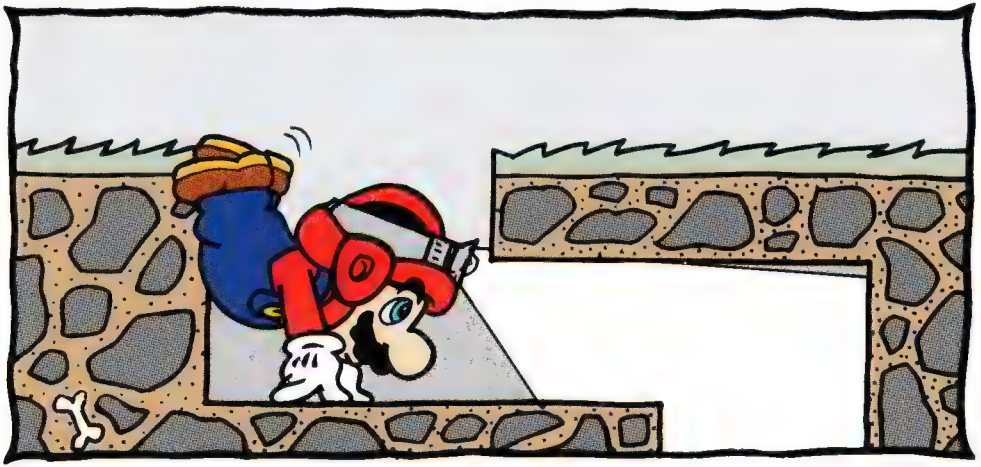

Illustration: Gary Fields

©1995 Nintendo

Earthworms

Earthworms may not be able to see or hear but they are sensitive to light and to vibrations.

3 Earthworms cannot see or hear.

© G. Lacz / Sunset

Earthworms are a favorite food of many birds and small animals. They also make good bait for catching fish!

There are over 1,800 species of worms in the world. Earthworms are found anywhere there is soil which has enough food and moisture to keep them alive. One species of earthworm in Australia grows to be about 11 feet (3.3 m) long.

Earthworms are constantly moving the soil around, eating it and excreting it. They also aerate the soil and encourage water to drain better. This makes it easier to for plants to grow.

Male and female in One

The earthworm's body is made up of as many as 150 segments. Each segment has a specific role and all have excretory organs. There are no male or female earthworms, they are hermaphroditic creatures—both male and female. All earthworms are able to lay the eggs or fertilize them.

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D3 054 29-17

Which animal is not a rodent?

THE STORY OF LIFE

1 Beaver
2 Mole
3 Rat

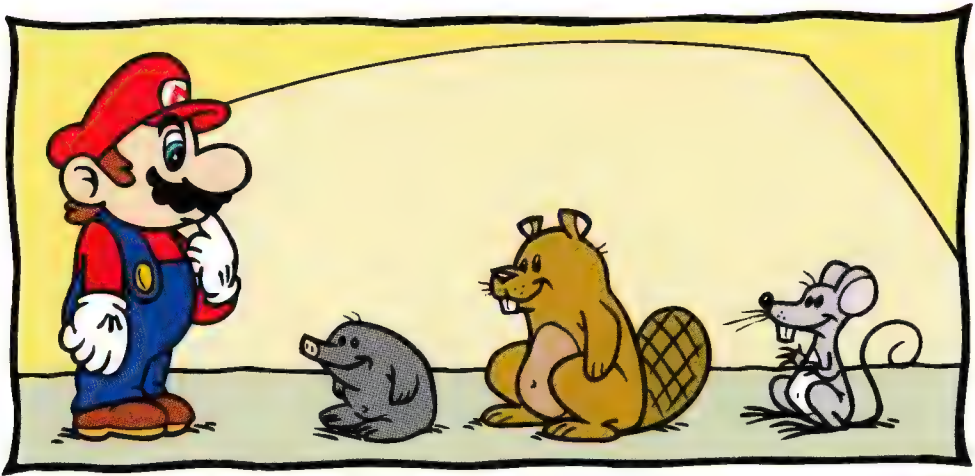

Illustration: Gary Fields

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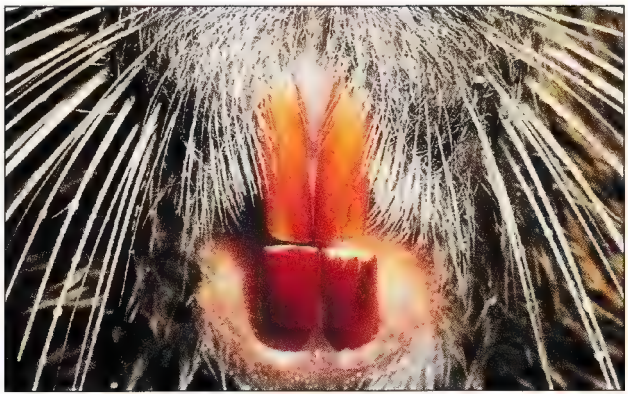
Rodents

The word "rodent" is derived from the Latin word meaning "to gnaw." There are approximately 1,800 species of these gnawing animals all over the world.

2 The mole is not a rodent.



© Animals Animals / Sunset

A rodent's front teeth keep growing and growing.

A rodent's four front teeth grow continuously, like fingernails. They are constantly being worn down from gnawing on wood, nuts, and anything else that might provide a tasty meal or material with which to build nests.

Beavers gnaw down small trees to build dams and nests. Rats will gnaw through wood, plastic, and even certain types of metal to get to a much desired snack.

Hungry Critters

Mice, squirrels, and woodchucks are among other common rodents. All of these creatures can consume the equivalent of their body weight in food each day. They really have to eat a lot to survive!

Rodents also produce numerous offspring. They are among the fastest breeding animals. Rats, for example, can have 100 babies each year.

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Which is a migratory bird?

THE STORY OF LIFE

1. Owl
2. Swallow
3. Blue jay

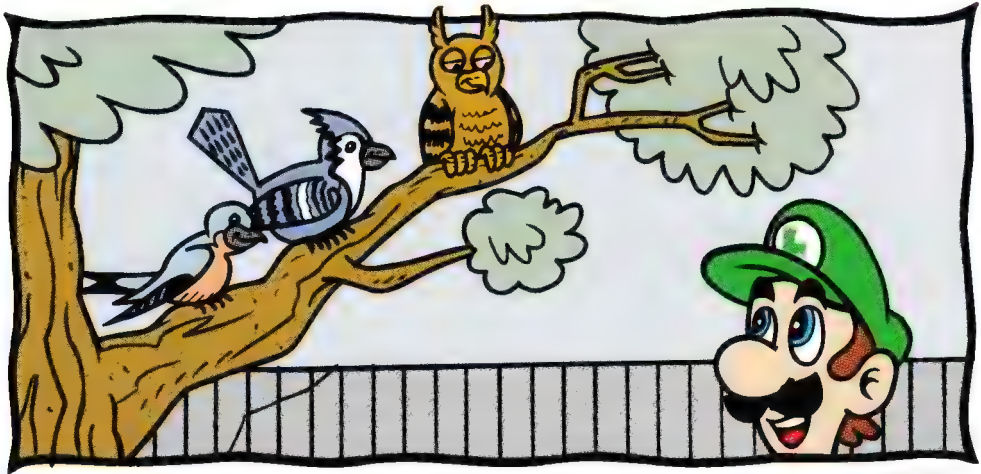

Illustration: Gary Fields

©1995 Nintendo

Swallow

At the end of summer many birds, such as swallows, fly south to spend the winter where the weather is warmer and food is more plentiful. In the spring they return north. This type of traveling is called migration.

2 The swallow is a migratory bird.

© S T F / Sunset

Migrating birds at rest on their way to or from their nesting place.

Many animals migrate but birds travel farther than any other animal. Barn swallows in the U.S. can be seen by the hundreds resting on phone lines on their way to and from their destinations.

Dancers in the Sky

The birds fly day and night, alone or in large groups resembling dark, dancing, whirring clouds in the sky. Small birds like swallows, fly lower than the bigger birds, such as geese.

In Spring migrating birds return north to their nesting places to lay eggs and nurture their young until it gets cold and it is time to go south once again.

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Which bird is extinct?

THE STORY OF LIFE

1 Cuckoo
2 Goose
3 Dodo

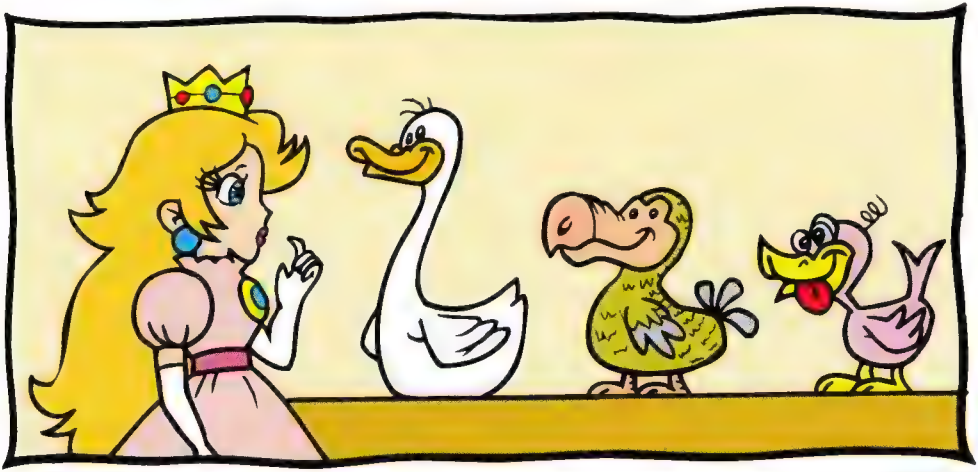

Illustration Gary Fields

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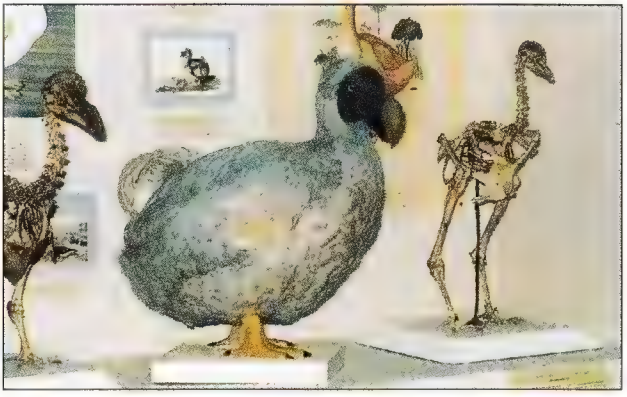
Extinction

Since the beginning of time animal species have appeared and evolved. But sometimes man steps in and disrupts the process of evolution, killing off an entire species. The dodo bird is one.

3 The dodo is extinct.



© C. Pavard / Hoaqui

The last dodo is said to have died in 1681. Here is a stuffed dodo next to a dodo skeleton.

The dodo was a native of Mauritius, an island in the Indian Ocean. It was discovered by Portuguese sailors in the early 1500s. The dodo was a large type of pigeon that was unable to fly. It was bigger than a turkey and weighed about 50 pounds (23 kg).

Disappearance of the Dodo

Because of its size and inability to move fast, let alone fly away, the dodo was an easy meal for both the explorers and the animals they brought with them. They gobbled up dodo birds faster than the species could reproduce. It took about one hundred years to get rid of every single dodo bird. Today, due to hunting, pollution, and the destruction of natural habitats, man is threatening the existence of many animals and birds. Naturalists trying to protect the animals are working hard to provide safe and protected environments in which endangered species can thrive.

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Which animal is endangered?

THE STORY OF LIFE

1. Squirrel
2. Jackal
3. Galápagos tortoise

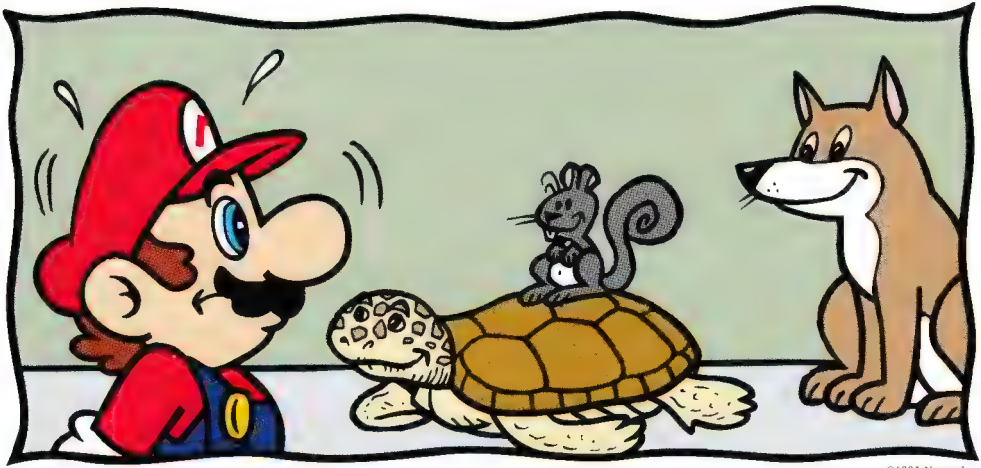

Illustration: Gary Fields

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Turtles and Tortoises

Turtles and tortoises are the oldest reptiles on Earth. They have been around since before the dinosaurs, more than 250 million years!

3 The Galápagos tortoise is an endangered species.

© N H P A / Sunset

Sea turtles lay their eggs in the sand on the beach but their nests are often pillaged by man or predators.

There are approximately 50 species of tortoises that live on land. The largest, Galápagos tortoises, can weigh as much as 400 pounds (180 kg) and live as long as 150 years. The turtle family is made up of seven main groups which are subdivided into over a hundred different species. Among these are sea turtles, which are endangered as well.

Endangered!

For many years tortoises and sea turtles were prized by both men and animals for their tasty meat, eggs, and shells. As a result both the tortoise and the sea turtle have become endangered species. Although they are now protected by law, it is up to humans to make sure that they are provided with a healthy, peaceful environment in which to live and reproduce.

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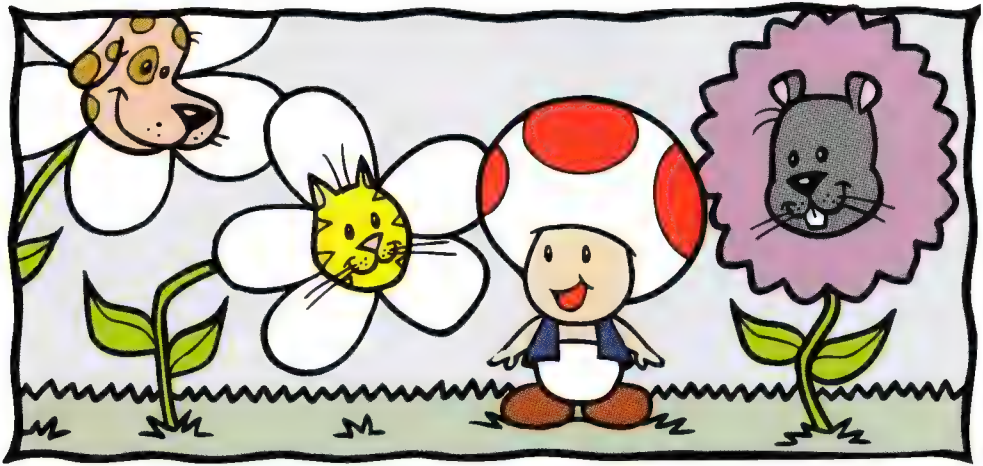
What is a nudibranch?

THE STORY OF LIFE

1. A tree branch without any leaves
2. A computer term
3. A flower animal



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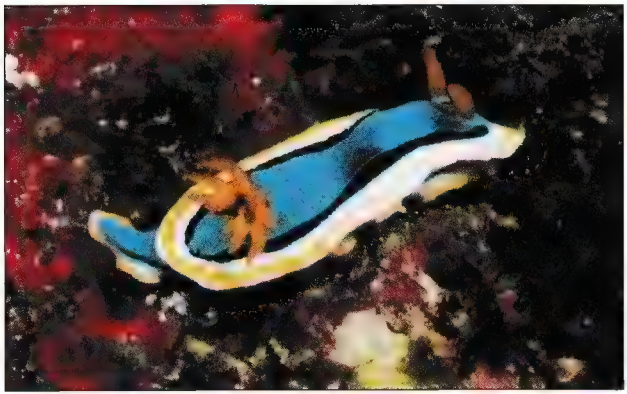
Nudibranchs

Because of their bright colors and shapes, some nudibranchs look like marine orchids but they are actually marine invertebrates.

3 A nudibranch is a flower animal.



© Animals / Sunset

Nudibranchs are both herbivores and carnivores depending on their species. The carnivores will even eat other nudibranchs.

Like slugs, nudibranchs long ago abandoned the shells their ancestors used to inhabit. The strange tentacle-like things that stick out of some species' backs and make them look like flowers are in fact believed to be respiratory organs. This sea creature also has two antenna-like projections on top of its head.

Some nudibranchs are herbivores and others carnivores, eating both plants and animals. Some of the smaller, lighter nudibranchs float along just under the surface of the water feeding on algae and tiny creatures where other bigger types glide along the bottom to find their food.

Camouflage

The colors and designs on the nudibranchs allow certain types to hide effectively in the sand, while others scare away predators with their bright colors.

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To what family do horseflies belong?

THE STORY OF LIFE

1. Tabanidae
2. Equidae
3. Muscidae

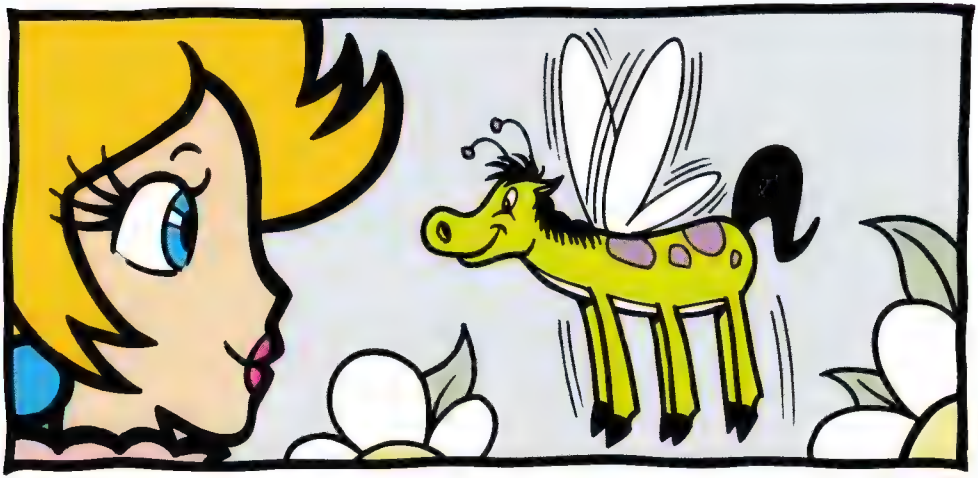

Illustration Gary Fields

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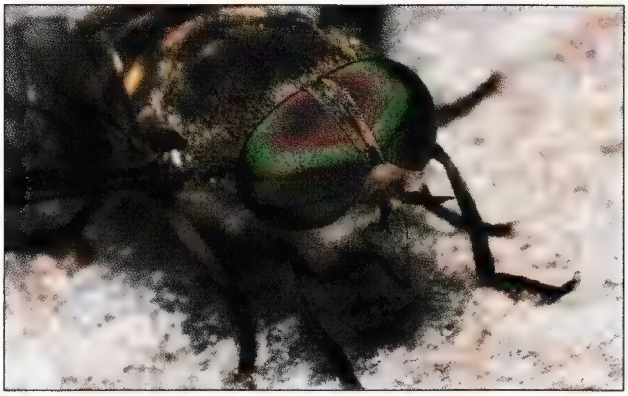
Horseflies

There are over 2,000 species of flies with short antennae commonly referred to as horseflies. These flies are usually stout-bodied, measuring up to 1 inch (30 mm) in length.

1 **Horseflies belong to the Tabanidae family.**



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Horseflies have broad heads, flattened bodies, and bright mutli-colored compounded eyes.

Female horseflies feed on the blood of animals. They use their mouthparts to pierce the animal's skin and suck its blood. Male horseflies do not bite. They feed on flower nectar. In the summertime female horseflies lay their eggs on water plants. After hatching, the larvae drop into the water or onto the wet ground where they feed on tiny animal life. Horseflies hibernate in the winter, spend the spring in the pupal stage and emerge as adults during the summer.

Disease Transmitters

Small horseflies are called deer flies, strawberry flies, or ear flies. These creatures can transmit diseases such as anthrax and tularemia to animals and humans. Anthrax is a bacterial disease that mostly affects sheep, horses, and buffalo. Tularemia is a bacterial disease that mainly affects rabbits and other rodents, but can be transmitted to humans via bites from infected horseflies.

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To what biological order does the bat belong?

THE STORY OF LIFE

1. Chiroptera
2. Dracularum
3. Insectivora

Illustration: Gary Fields

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Bats

The bat is the only mammal on earth that really can fly. Other so-called flying mammals such as the flying squirrel technically glide, they don't fly.

1 The bat belongs to the Chiroptera order.

© G. Lacz / Sunset

Flying squirrels don't actually fly, they glide. Bats are the only mammals that can beat their wings and fly.

Between 850 and 900 species of bats are known today. They can be divided into two groups: megabats—big bats, and microbats—small bats. Bats can be found all over the world except for the Arctic Zone and a few isolated ocean islands. Most are found in tropical and subtropical areas. Megabats are found only in the eastern hemisphere. Also called "flying foxes" because of their long fox-like faces, these animals can achieve a wingspan of 5.6 feet (1.7 m). The smallest microbat, Kitti's hog-nosed bat of western Thailand, measures only 1.1 to 1.3 inches long (2.9-3.3 cm) and weighs 0.07 ounces (2 g).

Bat Diets

Almost two-thirds of all bats eat insects. The others feed on fruit, nectar, and pollen. Very few are carnivorous, eating blood, fish, or other mammals. Contrary to popular belief, bats have well-developed senses of sight and smell.

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How do predatory birds capture their prey?

THE STORY OF LIFE

1. By digging it out of burrows
2. By swooping down and seizing it
3. By running after it on the ground

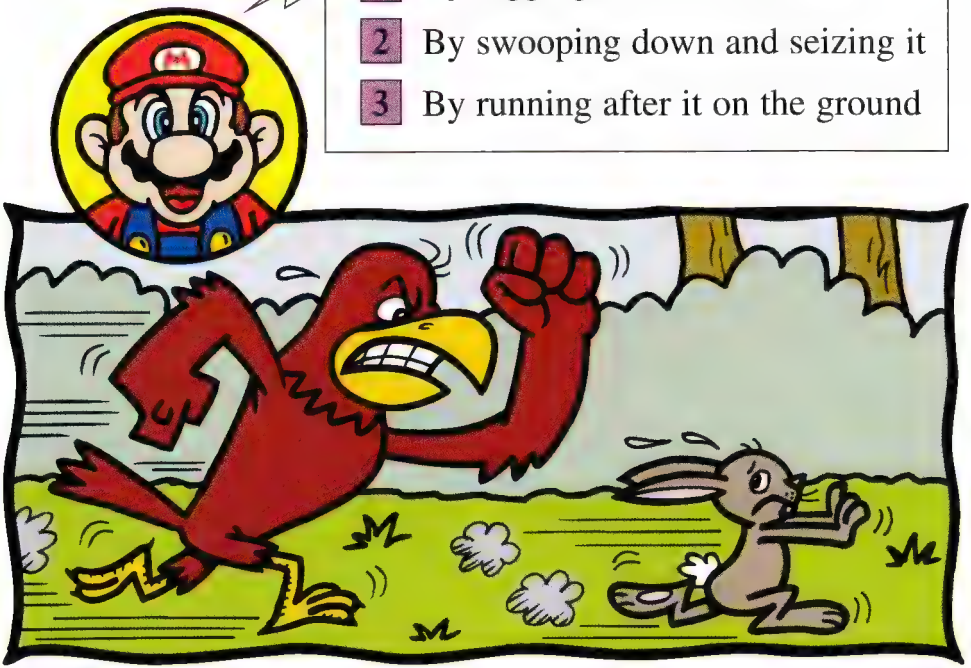

Illustration Gary Fields

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Raptors

Raptors, or birds of prey eat mainly small vertebrates such as fish, snakes, monkeys, rodents, rabbits, and birds.

2 Predatory birds capture prey by swooping down and seizing it with their talons.

© Sunset

A raptor uses its beak mainly for tearing up food. They also use it as a weapon to fight off enemies on the ground or in the trees.

Raptors include two orders of birds: hawks, or Falconiformes, and owls, or Strigiformes. Birds in the hawk order usually hunt during the day, while owls are nocturnal, hunting at night. Hawks and owls have some of the same features, including strong, hooked beaks and sharp, curved claws called talons.

Hawks and Owls

Hawks exist in varying sizes, from the African little sparrow hawk, with a wingspan of 14 inches (35 cm), to the rough-legged hawk, with a wingspan of 5 feet (1.5 m). Female hawks are larger than males. The eagle is a type of hawk. Its plumage is usually brown, black, or gray. The bald eagle, our national symbol, has white head feathers and dark body feathers.

Owls measure anywhere from 5 to 28 inches (13 to 71 cm) long. Most have large heads compared to their bodies; and flat, round faces with big, forward-facing eyes. Many owls have feathers around their toes and two tufts of feathers on their heads that look like ears or horns.

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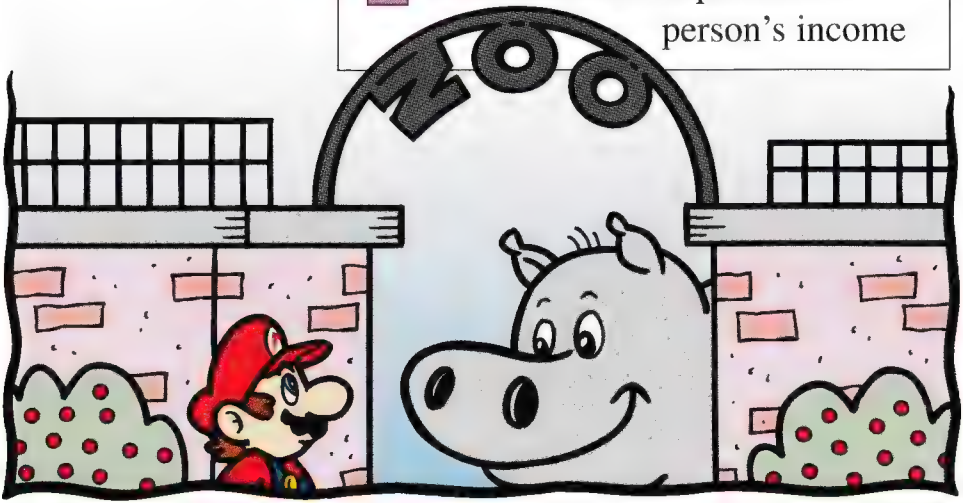
What is taxonomy?

THE STORY OF LIFE

1. The arrangement of living things into categories
2. The study of modern economics
3. The collection of part of a person's income



Illustration, Gary Fields

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Taxonomy

To show how living things are related to each other, 18th century Swedish naturalist Carolus Linnaeus developed a system of classification called taxonomy.

1 **Taxonomy is the arrangement of living things—plants and animals—into categories.**

© Sunset

Horses (*Equus caballus*) belong to the family Equidae, to the order perissodactyls just like the rhinoceros, to the class mammals just like humans, and to the phylum vertebrates just like fish.

Taxonomy links plants or animals based on shared traits such as body structure and behavior. The seven levels of classification, general to specific, are: kingdom; phylum; class; order; family; genus; species. The farther down you go, the closer the links are. Humans belong to the kingdom animalia, or animals, so we're distantly related to all animals, from ants to zebras. But we are more closely related to the class mammalia, or mammals, and even more closely related to the order of primates, which includes monkeys and apes.

Taxonomic Names

Biologists refer to plants and animals by their taxonomic names. These two-part Latin names indicate genus and species. The taxonomic name for humans is *Homo sapiens*—in Latin *Homo* means "man" and *sapiens* means "wise."

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How many living species of birds are there?

THE STORY OF LIFE

1. 374
2. 8,600
3. 15,400

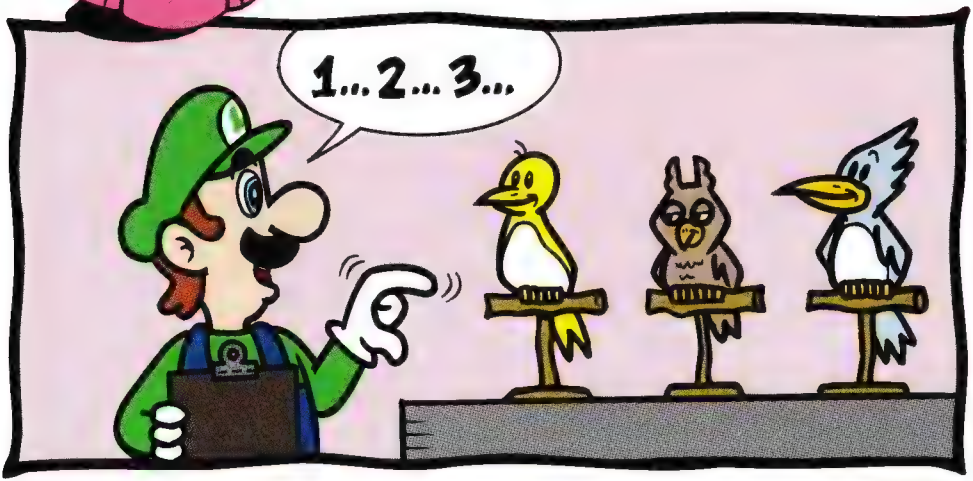

Illustration: Gary Fields

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Birds

Birds aren't the only animals that fly—bats and insects can fly, too—but birds are the only animals with feathers.

2 There are 8,600 known living species of birds in the world today.

© Sunset

Large, heavy birds, like the ostrich, cannot fly.

Like reptiles, birds are descended from dinosaurs. Feathers evolved from the scales of reptiles and were primarily an adaptation for warmth. They give the body a streamlined shape which decreases air resistance in flight, and they are also lightweight. A bird's hollow bones also keep its body weight to a minimum. Scientists think it would be impossible for a bird weighing more than 40 pounds (18 kg) to get off the ground.

Inspiring Humans

People designed airplanes based on the shape of a bird in flight. Yet airplanes and birds generally do not fly in the same way. Planes rise off the ground as they gain speed and the air pressure above their wings becomes lower than the air pressure below. The same occurs when birds like eagles and storks soar with their wings outspread. But, unlike planes, birds also fly by flapping their wings and pushing against the air, similar to the way we swim.

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What is the greatest threat to the survival of game birds?

THE STORY OF LIFE

1. Overhunting
2. Destruction of habitat
3. Pollution

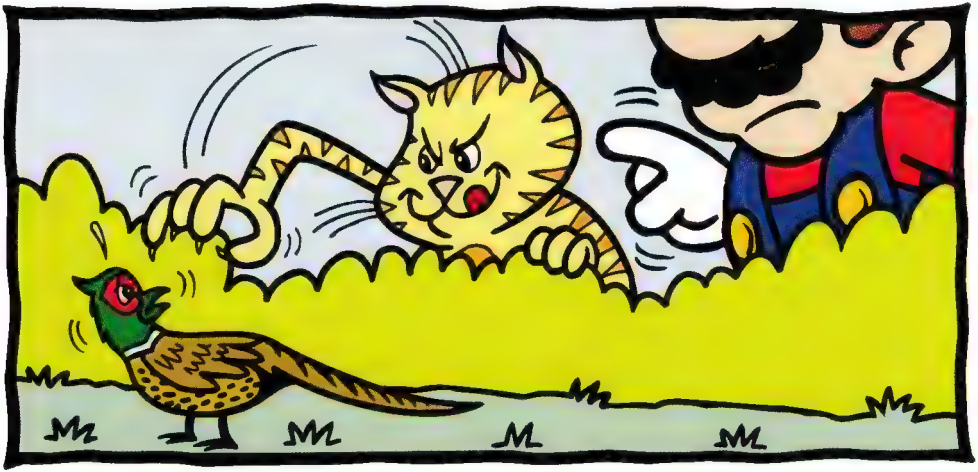

Illustration Gary Fields

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Endangered Birds

Game birds such as pheasant, partridge and quail become endangered when people kill more than they can eat at one time. But many kinds of birds are threatened with extinction for other reasons.

1 Game birds are threatened most by overhunting.

© NHPA / Sunset

The number of swallows has decreased because of DDT, a pesticide used in some parts of the world to kill locust swarms in farming areas. The swallows eat the locusts and are poisoned by the DDT.

Bird nests, often made in trees or bushes, are often lost to deforestation—the practice of clearing away entire forests at one time to make way for the spread of cities and highways. The use of pesticides and weed-killers also destroys many plants and insects that birds feed on. These changes disturb their birth and mating cycles, their population shrinks, and they become endangered.

Facing Extinction

Extinction of different animal species happened even before humans appeared on Earth. It was a result of changes in the climate, competition for food, or the hunting of one species by another. But human impact on the environment has been enormous, and many people think it is up to us to try to prevent more damage.

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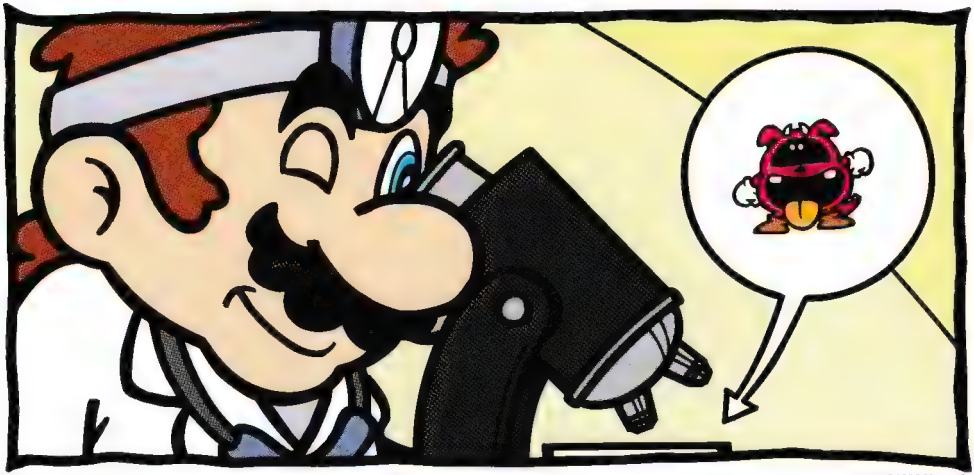
What is metamorphosis?

THE STORY OF LIFE

1. Plants creating food from photosynthesis
2. A type of mold found in cheese
3. Changes in the form and behavior of frogs and some insects



Illustration, Gary Fields

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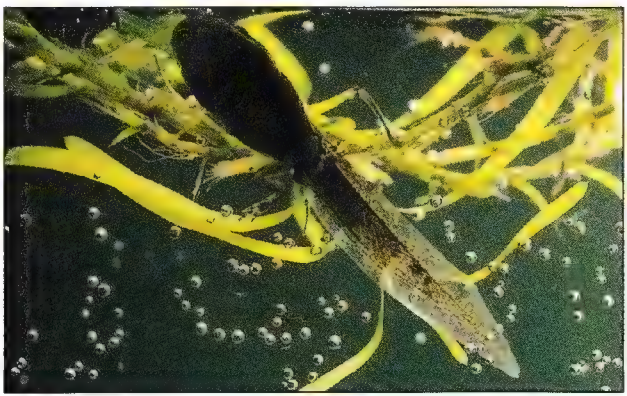
Metamorphosis

When the Dutch naturalist Jan Swammerdam spied butterfly wings on the caterpillar, he had discovered metamorphosis. He understood that the caterpillar and the butterfly were two different stages in the life of the same creature.

3 Metamorphosis is the change in form and behavior of frogs and some insects during their life spans.



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In addition to insects and amphibians, many animals undergo metamorphosis: sponges, shellfish, some mollusks, and fish such as lampreys and eels.

Frogs, flies, butterflies, and moths all undergo metamorphosis—radical changes in shape and behavior—during their life spans. Fertilized frog eggs grow limbs for swimming and are known as tadpoles. By the time they become adult frogs, their lungs, limbs and tongue will be bigger and stronger. Flies, moths and butterflies pass through the egg, larval and pupal stages before reaching maturity. Butterflies and moths begin life as caterpillars. This is called their larval stage. Next they reach the pupal stage. Their bodies produce a silk-like thread which they spin into protective casings called cocoons. When they emerge from these, they are in adult form, complete with beautiful wings.

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How do leeches move?

THE STORY OF LIFE

1. Using their suckers
2. Floating with water currents
3. Crawling on hundreds of tiny feet

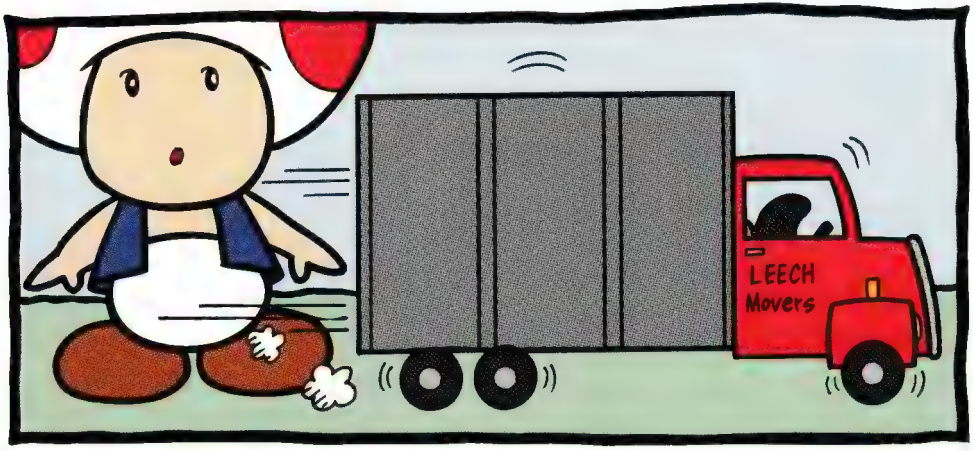

Illustration: Gary Fields

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Leeches

Leeches are parasites —they feed off of other living creatures. They use the suckers at both ends of their worm-like bodies to eat and to move.

1 **Leeches use their suckers to move them along.**

© H Chauvieton / Jacana

Only a few species of leech actually take blood from warm-blooded animals.

Leeches inch along like worms, using their front and rear suckers to anchor them down. The front sucker has either jaws or a proboscis—a tiny snout—which the leech uses to attach itself to its victims.

Bloodsuckers

Leeches feed on the blood of living animals, and they have different ways of doing so. For instance, leeches in tropical parts of Asia drop onto animals passing under trees and inflict painful bites on them. Other kinds attack underwater, where they glide along much as eels do.

Leeches live in stagnant (still) and shallow water such as is found in swimming holes. Only a few species actually take blood from warm-blooded animals. Leeches are often brightly colored and patterned.

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What group do spiders belong to?

THE STORY OF LIFE

1. Arachnids
2. Pseudopods
3. Reptiles

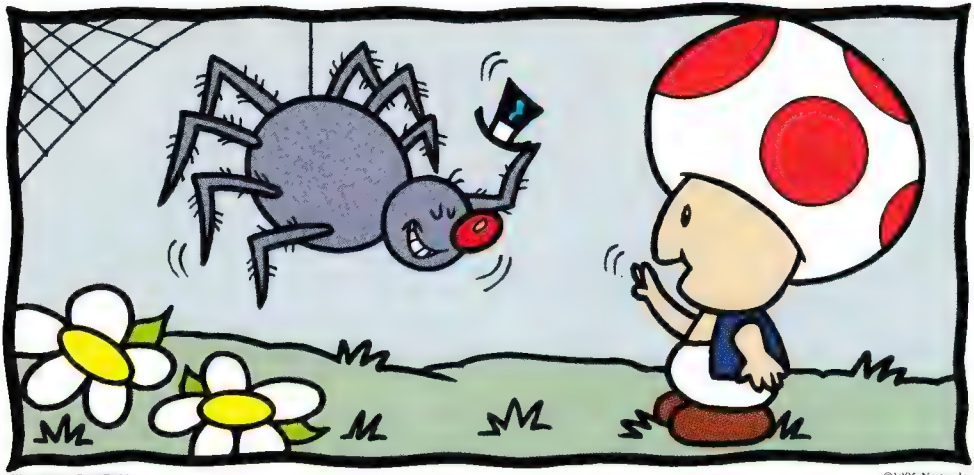

Illustration: Gary Fields

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Spiders

A spider is an eight-legged arachnid, with a tough outside shell, or exoskeleton, a segmented body, and jointed limbs that bend.

1 Spiders are classified under the class of arachnids.

© G. Lacz / Sunset

Scorpions, like other arachnids, have eight legs. Their tails end in a venomous fang and their claws end in strong pincers.

Spiders are all equipped with venom, but each kind of spider uses a different method to reach its prey. Most spiders are carnivores, or meat-eaters. House spiders and funnel spiders weave webs to catch insects. The jumping spider chases and pounces on its prey. The crab spider waits inside a flower to attack. Trapdoor and wolf spiders make tunnels and wait for their prey to fall in.

Spider Table Manners

Once caught, the prey is usually crushed and doused in digestive enzymes, or juices, so that the spider can swallow it. Some spiders inject a liquid into their prey that dissolves its insides, which the spider then sucks into itself. Spiders eat many insects that are a nuisance to humans. Only a few types of spiders are poisonous to humans; among them is the black widow spider.

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Where was the first modern zoo built?

THE STORY OF LIFE

1. Cairo, Egypt
2. San Diego, USA
3. Vienna, Austria

Illustration: Gary Fields

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Zoos

Collections of caged animals have been kept since ancient times, but in the past two hundred years, zoo animals have been able to roam more freely.

3 **The first modern zoo was built in Vienna, Austria, in 1752.**

© Len Sirman

Since World War II, a number of zoos have been developed as breeding centers for animal species in danger of becoming extinct.

Before the year 1000 BC, the ancient Chinese emperor Wen Wang established a 1,500-acre (600-hectare) zoo which he named the Ling-Yu, or Garden of Intelligence. Early Egyptian and Asian zoos were kept mainly as public spectacles, but the purpose of many modern zoos is the close study of animals.

Saving Species

The most famous zoos in the world include the Imperial Menagerie in Vienna, Regent's Park in London, the Berlin Zoo in Germany, the San Diego Zoo in California, and the zoos in Bombay and Calcutta, India; Cairo, Egypt; and Tokyo, Japan. Since World War II, a number of zoos have been developed as breeding centers for animal species in danger of becoming extinct. Two species that have been saved from extinction by zoo breeding are the nene, or Hawaiian goose, and the wisent, or European bison.

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How long do baby elephants stay close to their mothers?

THE STORY OF LIFE

1. 1 year
2. 5 months
3. 5 years

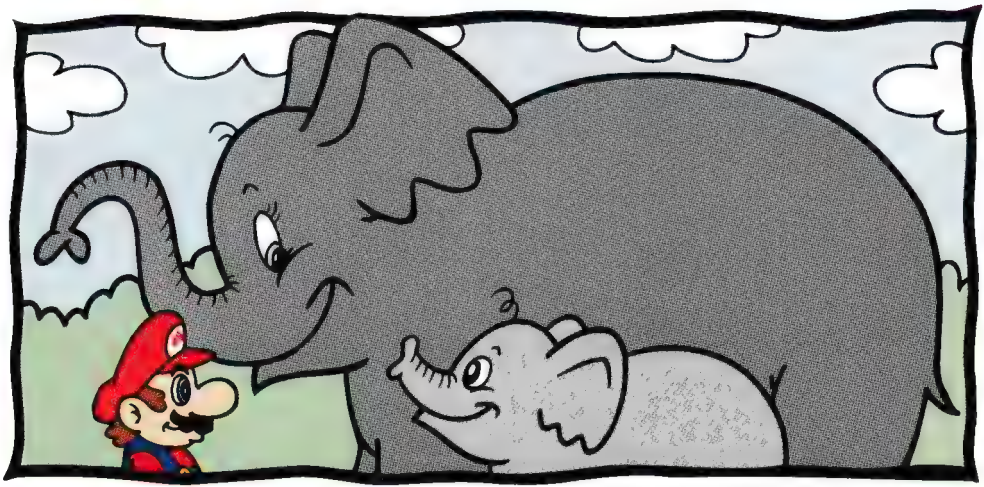

Illustration Gary Fields

©1996 Nintendo

Elephant Behavior

Female elephants, called cow elephants, typically mate by their 15th or 16th year, and carry their unborn babies for 21 to 22 months.

3 **Baby elephants feed on their mother's milk for nearly five years.**

© G. Lacz / Sunset

When elephants travel long distances they often walk in single file.

Generally only one baby elephant, or calf, is born at a time. Cows give birth to 5 to 12 calves in a lifetime. A calf can weigh almost as much as two adult humans. A fully grown elephant can weigh as much as ten small cars!

In the Herd

Elephants are outgoing and very sensitive to one another's calls and movements. They live in herds of 15 to 30 members that are usually related to each other and led by an old female, called a matriarch. Herds of Indian elephants are usually made up of females, baby elephants, and one old male, called a bull. Herds of African elephants often also include mature males, or bulls.

What are Tusks?

The elephant's tusks are large external teeth. They are used as weapons for fighting and as tools for digging for food. Elephants use their trunks to breathe, eat, smell, touch, and like hoses to wash.

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What is a paleontologist?

THE STORY OF LIFE

1. Someone who makes quilts
2. Someone who builds furniture
3. Someone who studies fossils

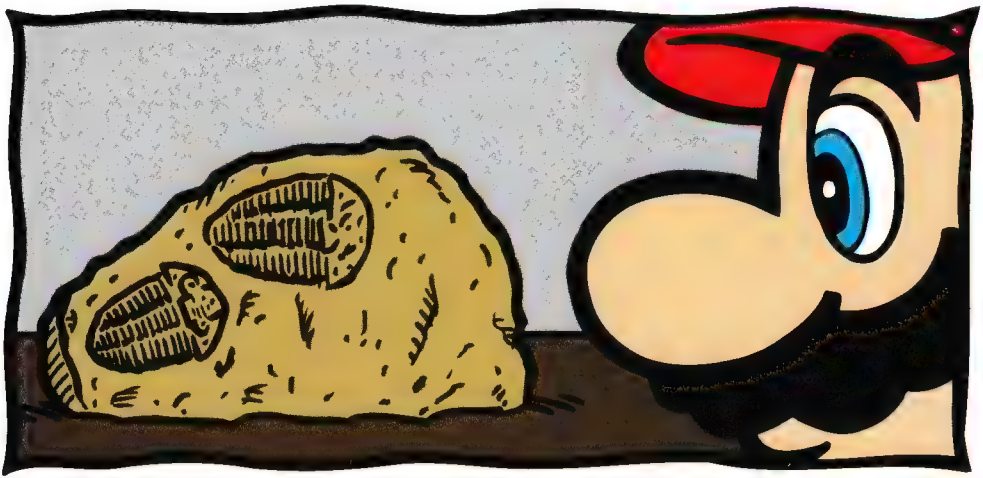

Illustration Gary Fields

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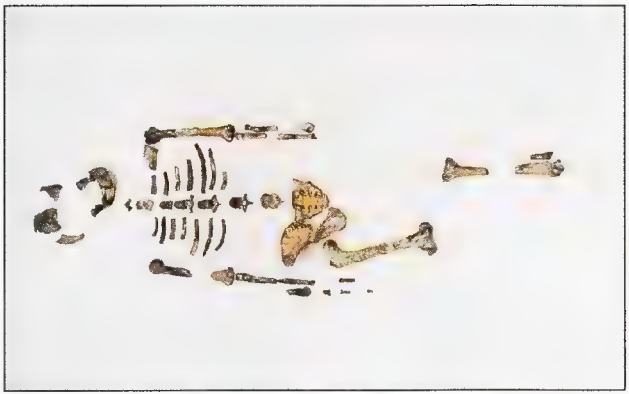
Paleontology

Paleontologists examine plant and animal fossils preserved in rocks. With the information they gather, they develop theories about the origins of life and the evolution of living things.

3 A paleontologist is someone who studies the origins of life by examining fossils.



© Len Sirman

These are the remains of Lucy, a woman from the Australopithic Era who walked upright. Hers is one of the oldest human skeletons ever unearthed.

Much of the rock that now covers the earth was at one time a softer material, such as clay, tar or silt. Plants, insects, and animals often became trapped in the soft soil. Over time, gravity hardened these softer soils into rock and the imprints of the trapped creatures remained.

Carbon Dating

Paleontologists use a method called carbon dating to calculate the age of a layer of rock or of an item they have found within it. Carbon-14 atoms are radioactive, and often enter into molecules of carbon dioxide, which is taken up by green plants. As long as the plants, or animals that feed on them, are alive, the level of radioactivity from carbon-14 in their tissues is constant. When the organism dies, however, the radioactivity decreases with time at a steady rate.

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What is Greenpeace?

THE STORY OF LIFE

1. An international environmental organization
2. A wilderness program for urban youth
3. A Dutch political party

Illustration: Gary Fields

©1996 Nintendo

Greenpeace

Greenpeace was founded in 1971 in Vancouver, British Columbia, Canada, to oppose U.S. nuclear testing in Alaska. The group has attracted a lot of publicity and participants, and has taken on many ecological issues.

1 Greenpeace is an international environmental organization.

© Len Sirman

Here, Greenpeace members on board their ship the *Zodiac* demonstrate at a nuclear test site.

Greenpeace supports "direct, nonviolent actions" to protect endangered wildlife, oppose industrial pollution, and end nuclear weapons testing. Most of Greenpeace's activism has focused on the ocean and its ecology.

Controversy

Greenpeace gained international attention in 1985 when one of its ships, the *Rainbow Warrior* docked in a New Zealand harbor, was sunk by two bombs planted by the French intelligence service (similar to the American CIA). The French government committed this violent act in order to prevent the crew of the *Rainbow Warrior* from going to protest at a French nuclear testing site in the South Pacific Ocean. The attention that Greenpeace has attracted from the media has helped to make people more aware of environmental issues.

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What is an oviparous animal?

THE STORY OF LIFE

1. An animal that eats its young
2. An animal that lays eggs
3. An animal that carries its young in a pouch

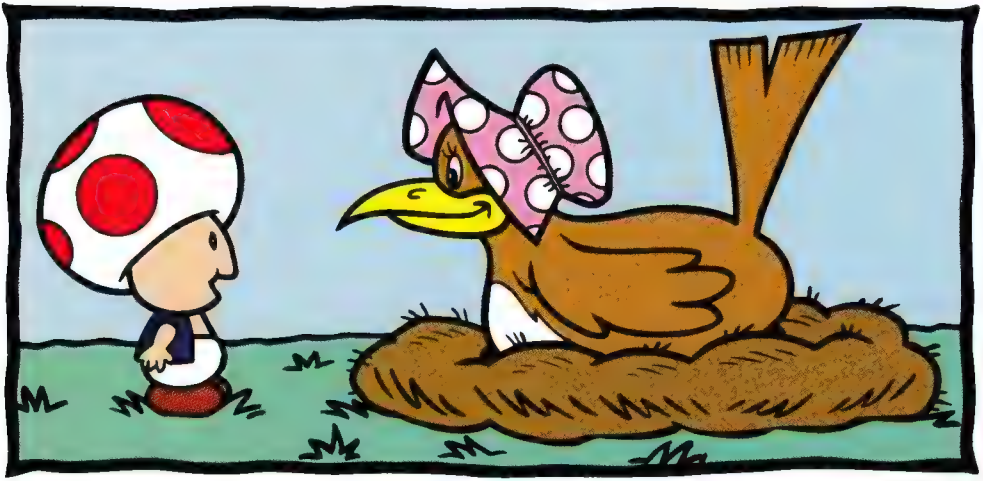

Illustration: Gary Fields

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Oviparity

Mammals, including humans, carry their young inside their bodies until they are ready to be born. They are viviparous. By contrast, oviparous animals lay eggs outside their bodies, in which their offspring develop until they are ready to hatch.

2 An oviparous animal is an animal that lays eggs.

© Chine nouvelle / Sipa Press

Ovoviviparity is another method of bearing young, found among certain kinds of reptiles. Ovoviviparous animals' eggs hatch within their bodies and are born live.

Most types of birds, insects, fish, and reptiles are oviparous. The number of eggs that most oviparous animals lay is far greater than the number of young that viviparous animals bear. However, the percentage of eggs that survive is lower, because in many species the mother does not protect the eggs once they are laid.

Protection

A hen is an example of a mother that protects her eggs by covering them with her body in the nest. On the other hand, fish leave their eggs in the water, and many of those eggs are eaten before they hatch.

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Are pandas an endangered species?

THE STORY OF LIFE

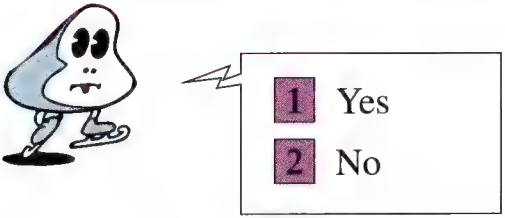

Illustration: Gary Fields

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Giant Panda

Fewer than 1,000 pandas, also known as giant pandas, exist in the wild today. Another 100 or so are kept in zoos.

1 **Yes, pandas are an endangered species.**

© Len Sirman

Giant pandas eat mostly bamboo in the wild, but in zoos they are fed cereals, milk, and garden vegetables.

The giant panda is a bear-like animal native to the bamboo forests in Tibet and southwest China. The average size of the panda is about 6 feet (1.8 m) long and about 286 pounds (130 kg). Giant pandas have a dense, woolly coat. Patches of fur covering the eyes, ears, legs, shoulders, and chest are black or brownish black. The rest of the fur is yellowish white. Pandas eat bamboo most of the time, occasionally feeding on other plants or even small animals.

Habitat and Mating

Most giant pandas in the wild today live in the mountain areas in and around China's Szechwan province. These areas have been set aside by the Chinese government as nature preserves in an effort to protect what remains of the giant panda's natural habitat. Pandas are generally solitary except during the mating season, usually in springtime. Only a few pandas have been born in captivity.

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What is thermoregulation?

THE STORY OF LIFE

1. A control system for home heaters
2. Seasonal changes in the climate
3. How mammals maintain their body heat

Illustration Gary Fields

©1996 Nintendo

Thermoregulation

Unlike cold-blooded animals, which must move from place to place to keep their body temperature stable, mammals metabolize their food, or convert it into heat.

3 Thermoregulation is the way in which mammals maintain their body heat.

© Animals Animals / Sunset

The fennec, which lives in the Sahara, has great big ears which release some of its body heat and help to keep it from getting too warm.

Your normal body temperature is 98.6°F (37°C), and your body works automatically to maintain that temperature. This is called thermoregulation. When you eat, your body breaks down, or metabolizes, food into heat energy. This heat energy keeps your body warm and provides the fuel you need to stay active. In a way, eating healthy food is like stoking your body's furnace.

Temperature Controls

Your body also has ways of fighting external forces to maintain its temperature. When you're cold, you shiver. That's because active muscles metabolize food faster. Shivering is your body's way of producing more heat. When you're hot, you perspire. The perspiration cools your skin and lowers your body temperature.

Although all mammals perspire, we don't all do it in the same way. For example, humans perspire through their skin. Dogs perspire through their tongues.

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When did the first signs of life appear on Earth?

THE STORY OF LIFE

1. About 3.4 million years ago
2. About 3.4 billion years ago
3. About 3.4 trillion years ago

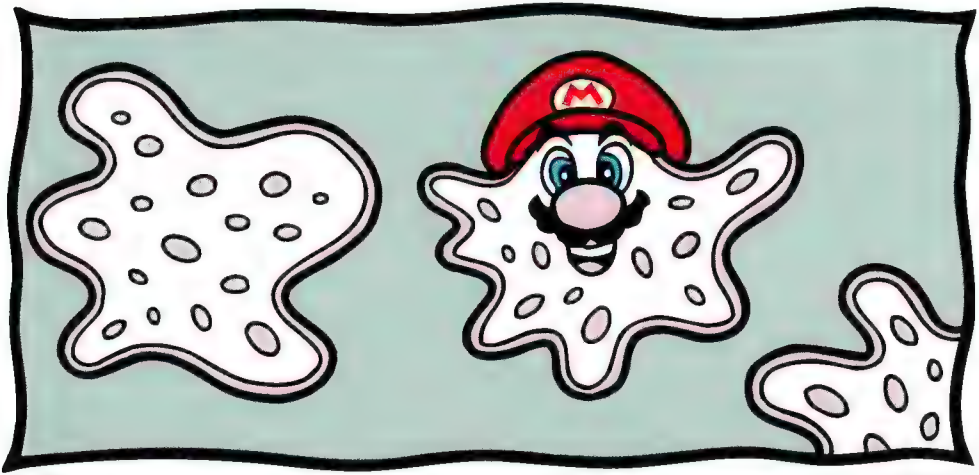

Illustration: Gary Fields

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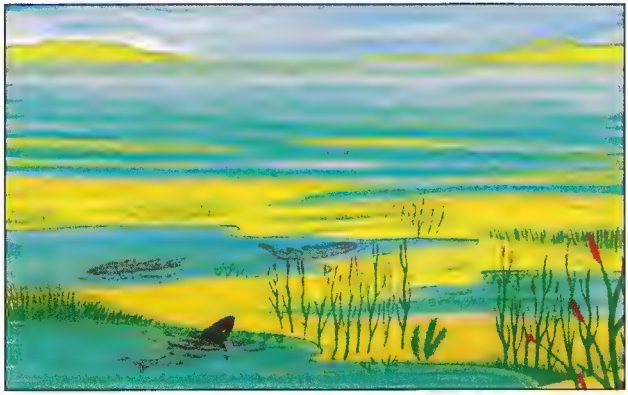
Origins of Life

Using theories of evolution—changes over time—scientists try to trace life forms back to their beginnings. The earliest known fossils are of single-celled forms that look like bacteria.

2 The first signs of life appeared on Earth about 3.4 billion years ago.



© P. Le Roch

Simple plants and animals lived in water. Land dwellers evolved about 400 million years ago.

At the time that life originated, Earth's atmosphere had only minimal amounts of oxygen. The earliest organisms must have fed on non-living organic, or carbon-based, compounds, but soon, organisms began using chemical and solar energy sources. The first and most primitive plants, related to algae, performed photosynthesis, which is the process by which plants convert light into energy. This released more oxygen into the atmosphere, which then could support more advanced life forms.

Animal Advances

Between about 700 and 570 million years ago, the basic body plans of modern animals were developed. The earliest animals resembled jellyfish, followed by burrowing worms. About 570 million years ago, skeletons developed in a number of species. From there, vertebrates—animals with internal skeletons—evolved.

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To which order do elephants belong?

THE STORY OF LIFE

1. Dromaiidae
2. Proboscidea
3. Lepidoptera

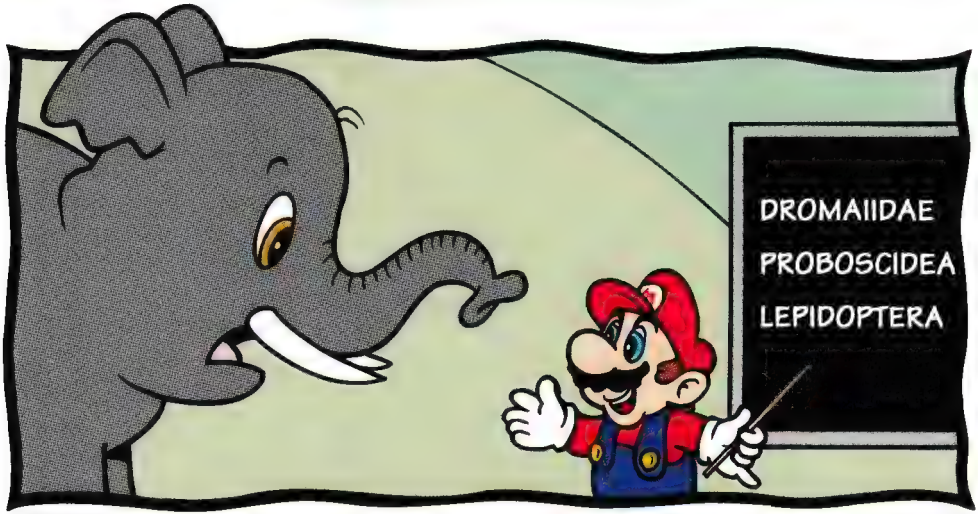

Illustration: Gary Fields

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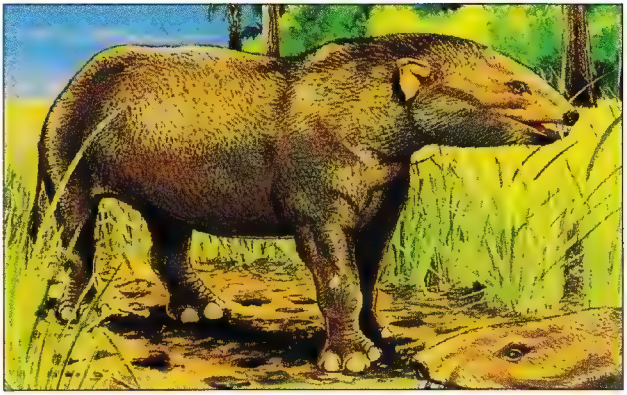
Elephant

Elephants are the largest living land animals. The only two surviving species, African and Indian elephants, are both endangered or nearly so.

2 Elephants belong to the order Proboscidea, which means "snouted."



© Y. Tabarès

This is what an elephant's ancestor, belonging to the order Proboscidea, probably looked like.

Elephants are massive animals. Their heavy bodies are carried by thick legs and broad feet. An elephant's trunk is a long, flexible snout with nostrils at the tip. The elephant uses it for carrying food and water to its mouth, for spraying water over itself, for smelling, and for lifting and investigating objects. The tusks on either side of the upper jaw are actually extra-long teeth.

A Single Enemy

In the wild, elephants have no natural enemies, but the valuable ivory in their tusks makes them a target of hunters and poachers. Elephants are intelligent and respond well to training. Indian elephants are used to haul logs in lumber forests and to march in processions, colorfully decorated. African elephants, on the other hand, are only rarely domesticated.

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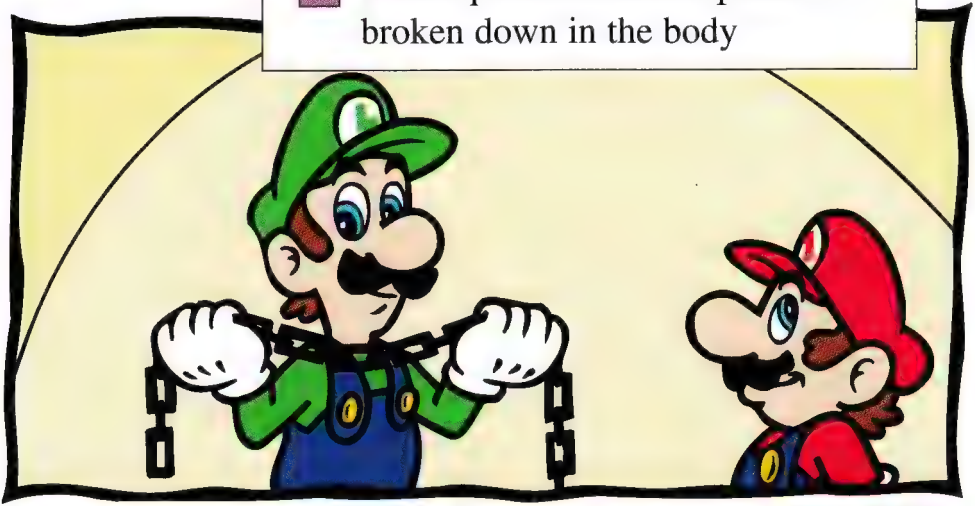
What is the food chain?

THE STORY OF LIFE

1. The sequence in which organisms eat each other
2. The sequence of digestive functions
3. The sequence in which proteins are broken down in the body



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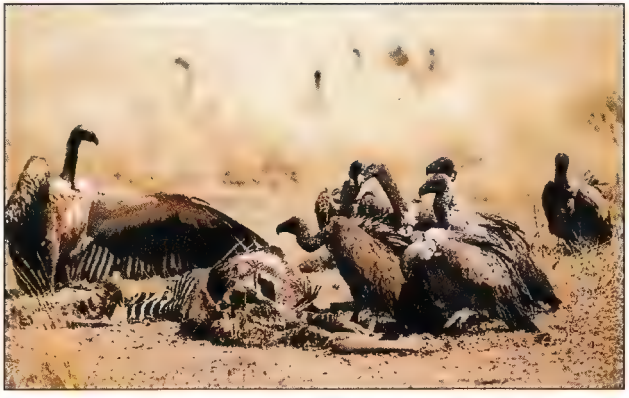
Food Chain

The food chain is the sequence of transfers of matter and energy from organism to organism in the form of food.

1 The food chain is the sequence in which organisms eat each other.



© G. Lacz / Sunset

Each animal and plant has a role to play in the food web. Minerals are taken from the soil into plants, which are then eaten by animals which eventually return to the soil.

Plants make up the first level in the food chain. They convert sunlight into energy and nutrients. Herbivores, or plant eaters, feed on the plants. This is the second level of the food chain. The third level are carnivores, or meat eaters, who eat the herbivores. Omnivores are organisms that consume both plant and animal matter. They belong to the second and third levels. Most humans are omnivores, reaping the full benefit of a variety of nutrition sources. Food chains intertwine in a food web because most organisms consume more than one type of plant or animal.

Eating and Being Eaten

Even dead matter is useful in the food chain. Detrital feeders are creatures that eat decaying material. Some detrital feeders, sprout fungi or mushrooms that are then eaten by squirrels, mice and deer. Larger detritivores include vultures, jackals, crows, and worms.

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What would you find in a science museum?

THE STORY OF LIFE

1. Collections of rare insects
2. Airplanes used in World War II
3. Ming Dynasty vases

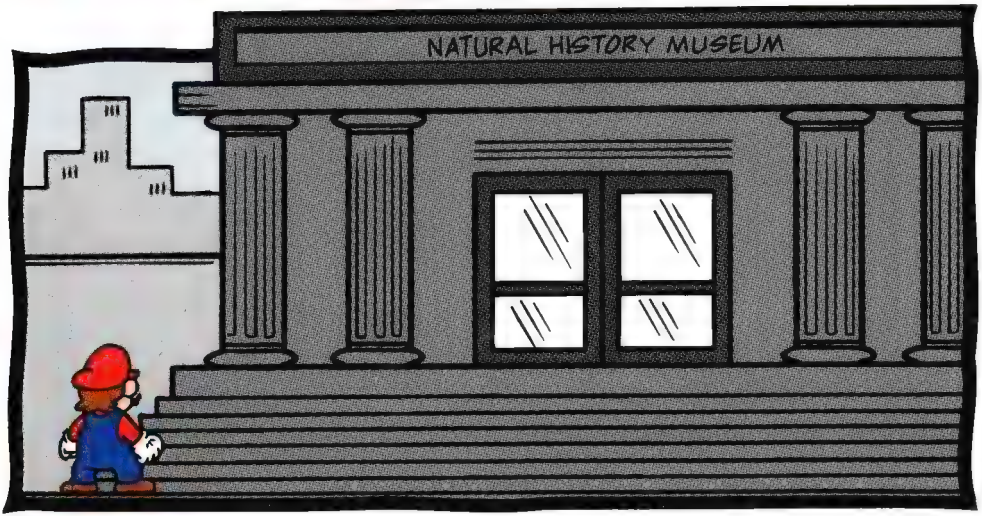

Illustration: Gary Fields

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Science Museum

Science museums preserve and exhibit scientific specimens. Such museums aim to stimulate public interest in science and educate visitors in an entertaining manner.

1 In a science museum, you would find collections of rare insects.

© A. Le Toquin / Explorer

France's natural history museum holds one of the world's most extensive insect collections.

The first science museums were established in Renaissance times, when scientists organized their collections of plant and animal specimens into "cabinets of curiosities" to share with their colleagues.

The French National Museum of Natural History in Paris was opened in 1635 under King Louis XIII, mainly as a center for the propagation and study of medicinal plants. In 1739, it was expanded to include displays of animals and minerals.

Science museums geared toward physical and social anthropology—the study of human history—were established in Latin America and the United States during the 19th century.

Science Museums Today

Today, many science museums include exhibits that focus on conservation and ecology.

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What is the main difference between butterflies and moths?

THE STORY OF LIFE

1. Moths do not go through the four life stages that butterflies do
2. Moths fly primarily at night, butterflies primarily in the day
3. Moths eat insects, butterflies do not

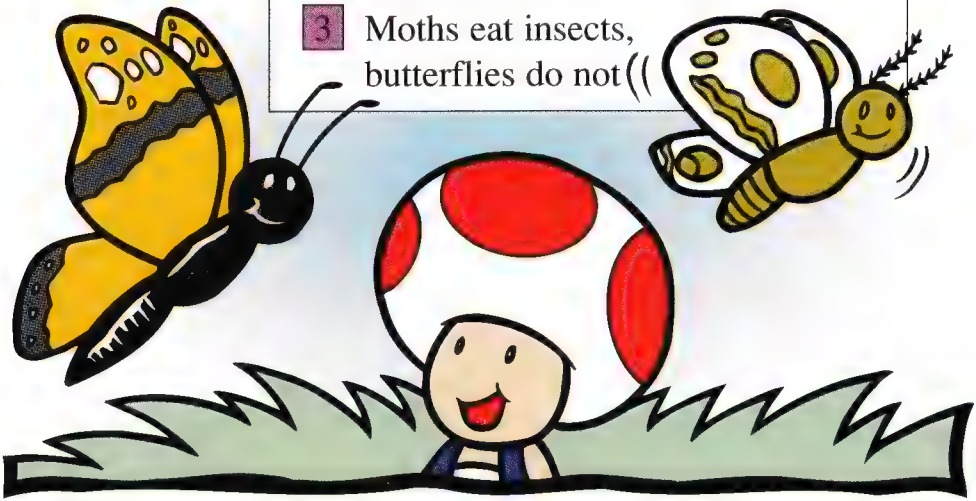

Illustration Gary Fields

©1996 Nintendo

Moths and Butterflies

Like moths, butterflies' wings, bodies, and legs are covered with dustlike scales that come off when they are handled. Unlike moths, butterflies are usually brightly colored and are active during the day.

2 Most moths fly primarily at night, while most butterflies fly primarily during the day.

© Superstock

This Tiger Swallowtail butterfly pollinates plants as it moves from flower to flower in search of food.

Butterflies and moths are members of the second largest insect order, outnumbered only by beetles. Both adult butterflies and moths have well-developed eyes, prominent antennae, and mouthparts consisting of a long, coiled sucking tube, or proboscis. They both undergo the same complete metamorphosis in its four stage cycle: egg, caterpillar, cocoon, and adult. After mating, adult females of most species lay their eggs on a plant that serves as the food source for the larvae when they hatch.

Any Real Differences?

No absolutely consistent characteristics exist for separating butterflies and moths although, in general, butterflies are more brightly colored.

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Where do amphibians live?

THE STORY OF LIFE

1. Only in the water
2. In the water and on land
3. Only on land

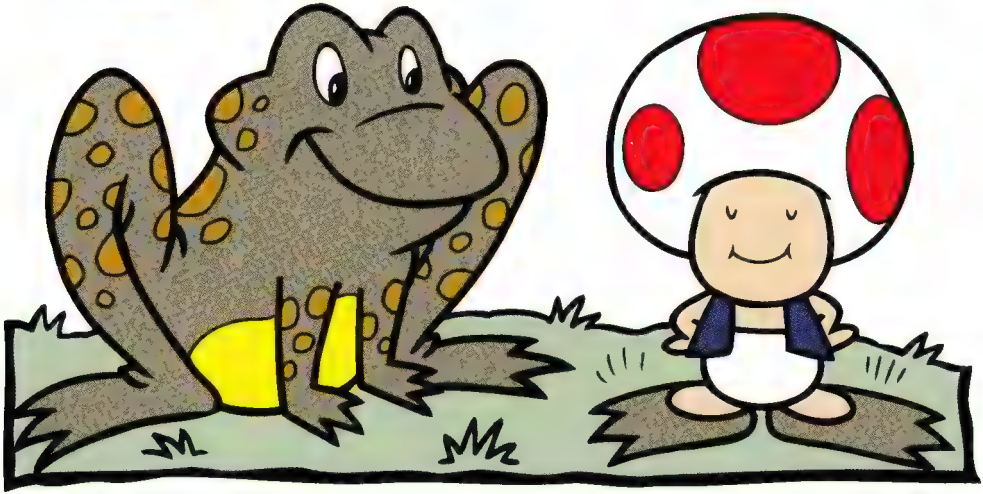

Illustration: Gary Fields

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Amphibian

The word amphibian comes from the Greek *amphibios*, meaning "living a double life." Most amphibians live their lives in two different places: on land and in the water.

2 Amphibians are animals adapted to life in the water and on land.

© Animals Animals / Sunset

Many frogs and toads have a long, sticky tongue for catching the insects they eat. They swallow their prey whole, without chewing.

There are about 4,000 species of amphibious animals. Amphibians lack waterproof skin, cannot survive in dry conditions, and most return to the water to lay their eggs. All amphibians are carnivores, feeding primarily on insects.

Body Structure

Several characteristics distinguish amphibians from other animals. All amphibians have glandular skin with no feathers, fur, or scales. They have two lungs and a three-chambered heart.

Amphibians are divided into three main groups, based on body structure: frogs and toads, newts and salamanders, and the caecilians. Frogs and toads have no tails and stout bodies with muscular hind limbs for leaping. Newts and salamanders have tails and four short legs roughly equal in size. Caecilians are wormlike. They have no legs and are adapted for burrowing.

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Can crickets fly?

THE STORY OF LIFE

1 No, crickets can't fly.

2 Yes, crickets can fly.

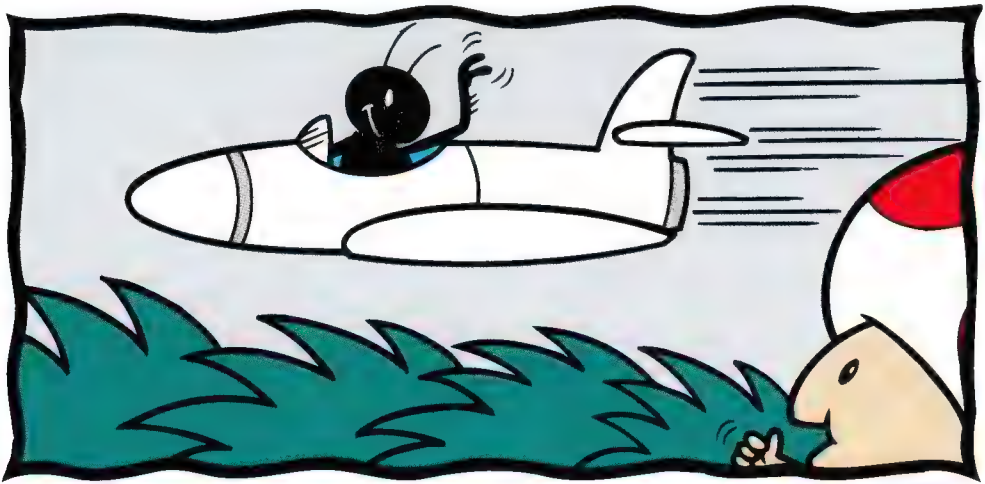

Illustration: Gary Fields

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Cricket

Birds are not the only animals capable of flying. Bats can fly, and so can crickets and many other insects. Crickets fly by leaping into the air and spreading their wings.

2 Yes, crickets can fly.

© NHPA / Sunset

Crickets fly by alternately contracting longitudinal and transversal muscles along the thorax, or midsection, of their bodies. These muscles make the thorax expand and contract, causing the wings to move.

Crickets are omnivores, feeding on plants and other insects. All species have thin antennae and long hind legs for jumping. They fly using their two stiff, leathery forewings and two long, transparent hind wings. Crickets don't have ears. They sense noise with organs on their forelegs highly adapted for sound reception.

There are about 2,400 species of crickets, varying in length from 0.12 to 2 inches (3 to 50 mm).

Chirping

Male crickets are known for their chirping. Unlike birds, they make noise with their wings. They do this by scraping the edge of one forewing against the serrated edge of the opposite forewing. Male crickets chirp to attract females to mate with and also to scare away other males.

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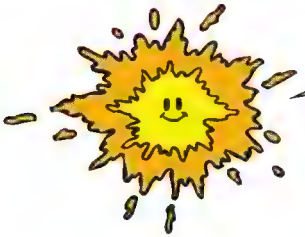
What are baby geese called?

THE STORY OF LIFE



1. Owlets
2. Chicks
3. Goslings

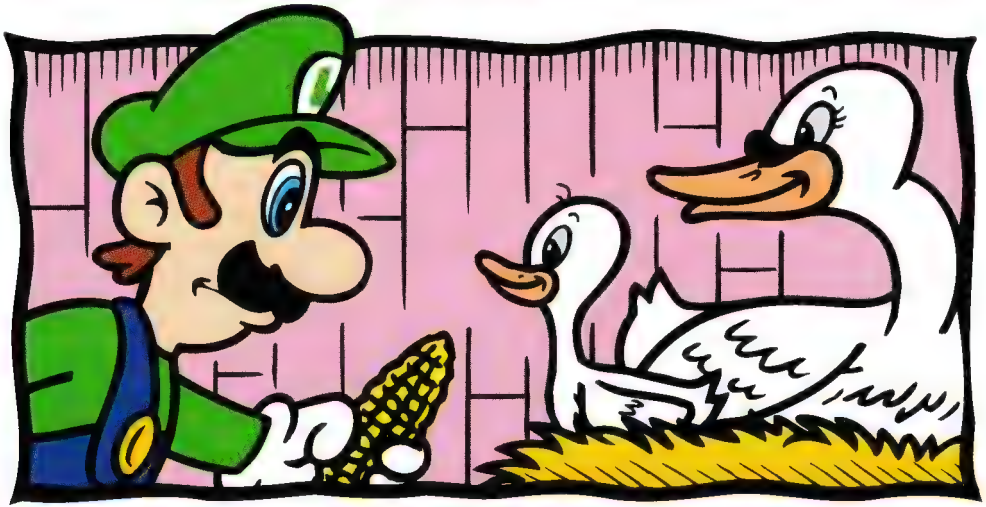


Illustration Gary Fields

©1996 Nintendo

Goose

Geese are generally larger than ducks and smaller than swans. They migrate but are able to spend the winter as far north as Alaska and New England.

3 **Baby geese are called goslings.**

© Japack / Sunset

The most common and best-known goose in North America is the Canada goose. While there are many different types of Canada goose, all have a white patch on each cheek and a black tail, head, and neck. The rest of the feathers are a shade of brown.

Geese have heavy bodies, webbed feet, and oily feathers which repel water. Male geese, called ganders, are usually slightly larger than females, or hens. A goose's bill is convex at the base and tapered toward the tip. It is adapted for grasping the grasses and sedges that comprise a goose's diet.

Many species of goose migrate south for the winter. Geese are powerful fliers, traveling at high altitudes in V-formation. They make loud honking and gabbling cries while flying or when danger approaches.

Life Cycle

Geese build simple nests on the ground. While the gander stands guard, the hen lays 3 to 12 whitish, rough-surfaced eggs and incubates them over a period of 24 to 33 days. Geese live for 10 to 15 years in the wild and can live to over 30 in captivity.

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What is a cygnet?

THE STORY OF LIFE

1. Young swan
2. Type of bear
3. Family of groundhogs

Illustration Gary Fields

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Swan

Swans are known for their graceful, long necks. They fly with their necks outstretched but swim with it curved in. They often stand on one foot, tucking the other close to the body.

1 A cygnet is a young swan.

© Tainturier / Jerrican

When cygnets are born, they have short necks and thick, downy feathers. They can run and swim only a few hours after hatching.

Of the six different species of swans, the most well known is the mute swan. Mute swans are native to Europe and Asia but now live in many parts of the world.

They are entirely white and have an orange bill with a black knob at the base. Swans are vegetarians, feeding mainly on grass and water plants.

Mating and Nesting

Like geese, mute swans mate for life. During breeding season, males stake out territory and fiercely defend it. Pairs of swans return to the same territory year after year, building nests of twigs and grass in the tall reeds at the water's edge. Mute swans usually nest individually. The female lays and incubates 5 to 7 eggs while the male watches over the territory. Cygnets are ready to leave their parents when they are 4 or 5 months old.

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How many species are carnivores?

THE STORY OF LIFE

1 About 120

2 About 230

3 About 360

Illustration, Gary Fields

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Carnivores

Animals that eat meat are called carnivores. Those that eat plants are herbivores, and those that eat both meat and plants are omnivores.

2 **There are about 230 species of carnivores.**

© G. Lacz / Sunset

Some people think carnivores are vicious or mean, but carnivores don't kill unless they need to eat, and they never kill more than they require.

What do humans have in common with lions, bears, wolves, and raccoons? We all are animals that eat meat. But while humans eat both meat and plants, carnivores live on meat almost exclusively. In the animal kingdom, carnivores are found in five families: the cat family, which includes lions and tigers; the dog family, which includes foxes and wolves; the bear family, which includes polar bears and grizzlies; the raccoon family—raccoons and pandas; and the weasel family—weasels and ferrets. All of these animals will eat plants on occasion, but they prefer meat.

Lethal Teeth

Carnivores are naturally adapted to eating meat. They have four large, sharp teeth that can rip through the flesh of their prey. They also use their teeth to kill their prey—usually grabbing the animal at the back of the neck and biting through the neck or shaking it sharply to break it and kill the animal.

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Are there mammals that don't have teeth?

THE STORY OF LIFE

1. No, all mammals have teeth.
2. Yes, some mammals are considered toothless.

Illustration: Gary Fields

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Edentates

Toothless mammals are known as edentates. This unusual group includes anteaters, armadillos, and sloths.

2 Yes, some mammals are considered to be toothless.

© N.H.P.A. / Sunset

The three-toed sloth is an edentate—a toothless mammal. It lives in tropical rainforests in Central and South America and feeds on leaves.

Strictly speaking, only the anteater with its long pointy snout is a completely toothless mammal. Armadillos and sloths have small teeth that are basically useless. Since these animals can't chew well, their diets are limited and specialized. Anteaters use their long sticky tongues to reach deep into insect holes and slurp up ants and termites.

Sloths feed mainly on leaves, since they live in trees and are almost unable to walk on the ground. Armadillos eat insects and plants, and occasionally feed on dead animal carcasses.

Edentates don't derive much energy from their limited diets, so their bodies have to compensate. Their metabolic rates, or the speed at which they burn calories for energy, is actually slower than that of other animals of the same size and weight. Their body temperatures also are low, so they require less food energy to maintain their body temperature.

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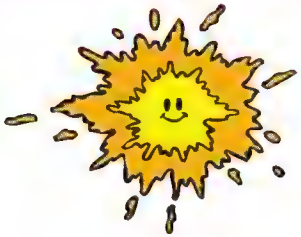
What sound does an elephant make?

THE STORY OF LIFE



1. Roar
2. Snort
3. Trumpet

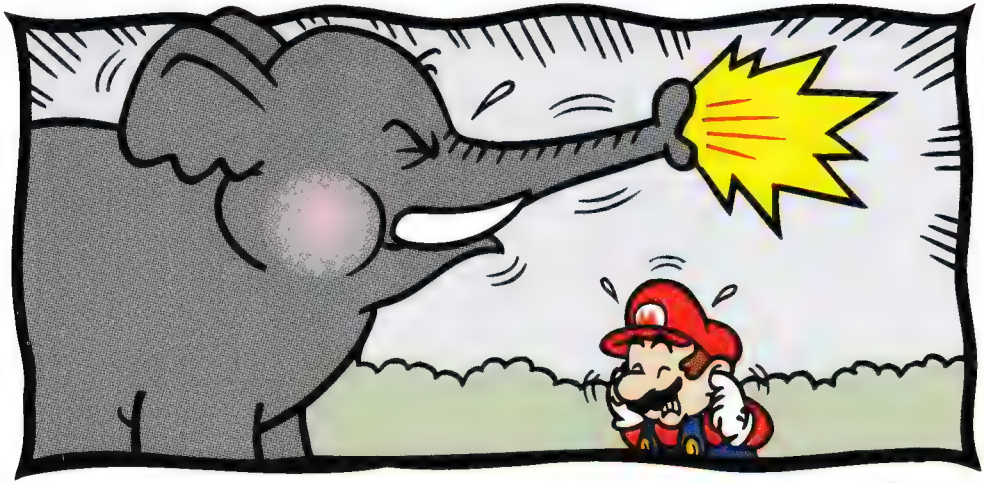


Illustration: Gary Fields

©.996 Nintendo

Animal Sounds

Sheep bleat, horses whinny, dogs bark...animals make noises to express hunger, physical attraction, anger, and contentment.

3 Elephants are said to trumpet.

© G. Lacz / Sunset

When male deer search for mates they make noises to attract females and chase away other males. The red deer makes a sound like a roar. Sika deer scream or whistle.

Dogs bark when they sense danger or when they want to attract their owner's attention (like at suppertime!). When they're in pain, dogs will cry or howl. Cat owners know that cats meow when they're hungry. When they're happy and content cats purr.

Call of the Wild

Wild animals make noises, or vocalize, for many reasons. Wolves howl to announce their location so other wolf packs won't invade their territory. Usually the entire wolf pack joins the chorus and the sound carries throughout the pack's territory. Though howling might sound threatening, wolves do it so two packs won't meet and start a fight.

A Baby's Cry

Adult animals make noises to call to their young. When young animals are left alone, they cry for their mothers. Most will squeak or mew, but hungry baby anteaters whistle to get attention!

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Which dinosaur was the longest?

THE STORY OF LIFE

1. Compsognathus
2. Diplodocus
3. Stegosaurus

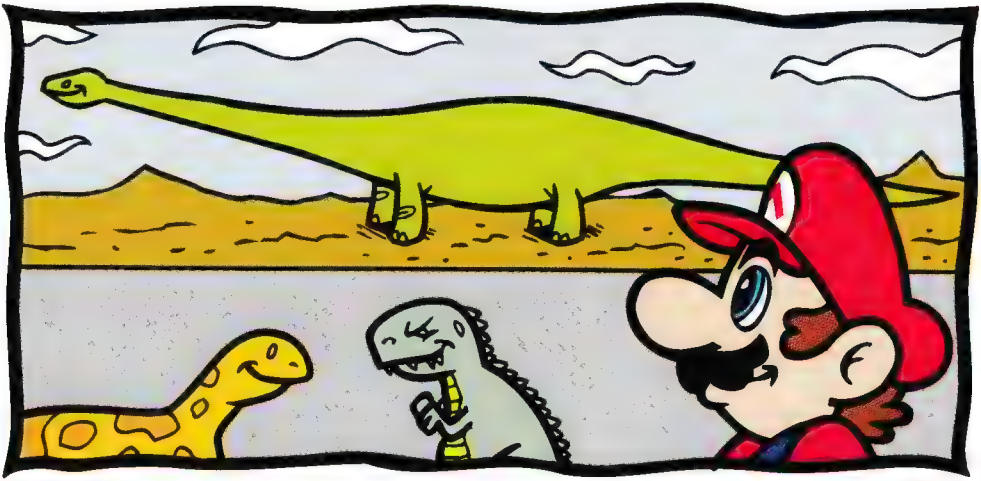

Illustration Gary Fields

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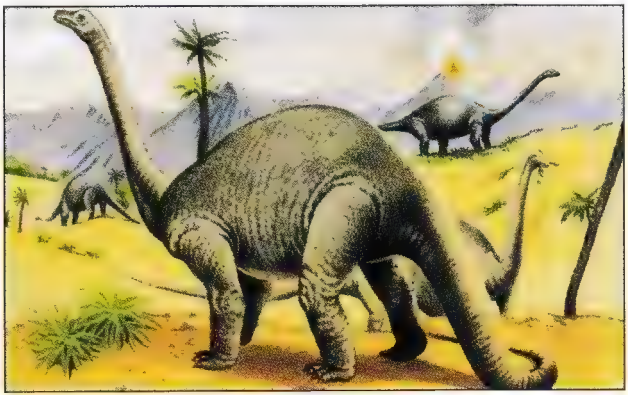
Diplodocus

With its neck and tail extended, diplodocus measured as much as 87 feet (28 m).

2 Diplodocus is considered the longest of all the dinosaurs.



© E. Mercier

Diplodocus had a tiny head compared to the rest of its body. Remains of diplodocus have been found in Colorado, Montana, Utah, and Wyoming.

Diplodocus was one of the dinosaurs known as sauropods. They had four thick legs, bulky bodies, and thin necks and tails. They weighed as much as 12 tons (10 tonnes).

Giant Vegetarians

Although diplodocus was enormous, it dined only on plants. With its long neck, it could reach leaves on the highest tree branches. It's also possible that diplodocus spent some of its time wading through water and eating algae and aquatic plants.

Group Defense

Diplodocus was not a predator. It had relatively small teeth—not the sharp, flesh-ripping teeth of a carnivore. Since it couldn't bite its enemies, diplodocus used its powerful tail to strike them. It's likely that the diplodocus traveled in herds to protect themselves from attack.

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What's the scientific name of the brontosaurus?

THE STORY OF LIFE

1. Apatosaurus
2. Armadillo
3. Triceratops

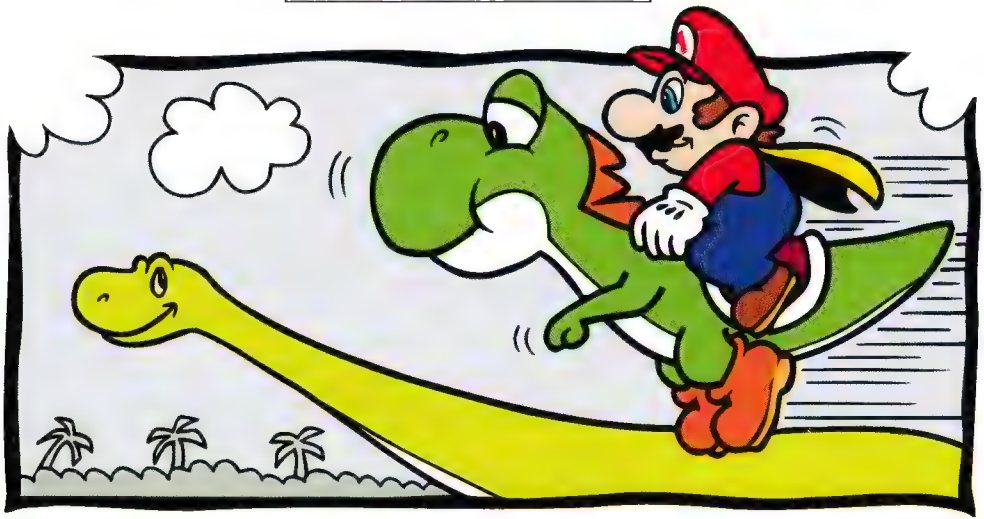

Illustration Gary Fields

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Apatosaurus

Paleontologists, the scientists who study fossils, refer to the brontosaurus as apatosaurus, the name it was given when the first fossil of the dinosaur was discovered.

1 **The scientific name for the brontosaurus is apatosaurus.**

© E. Mercier

Apatosaurus had a small head with a pointed snout and small, pointed teeth. It wasn't until the 1970s that paleontologists finally matched apatosaurus's head to its body!

By any name, this ancient reptile is among the best-known dinosaurs. It had a huge, rounded body, a long, heavy tail, and four thick legs. Apatosaurus measured about 70 feet (20 m) in length and weighed about 35 tons (32 tonnes). It was a herbivore, or plant-eater.

Don't Lose Your Head

Apatosaurus bones have been found in Colorado, Utah, and Wyoming, as well as in Europe. Strangely enough, the bodies are usually discovered headless. This was probably because the dinosaur's head and neck were the most fragile parts of its body. When the dinosaur died and fell to the ground, they broke apart. Paleontologists who found the first apatosaurus skeleton, in 1877, accidentally matched its body with the head of a different dinosaur. The error was finally corrected in the 1970s.

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When did mammals first appear on Earth?

THE STORY OF LIFE

1. 100 million years ago
2. 205 million years ago
3. 312 million years ago

Illustration Gary Fields

©1996 Nintendo

Mammals

When mammals first appeared on Earth, reptiles were the dominant animals; and the most dominant reptiles were dinosaurs.

2 Mammals first appeared on Earth about 205 million years ago.

© Len Sirman

A meteor striking Earth might have caused a huge shift in the planet's temperature. Cold-blooded reptiles, like dinosaurs, couldn't survive the change.

The period in Earth's history beginning about 250 million years ago and ending 65 million years ago is the Mesozoic era. It's called the age of reptiles because dinosaurs and other reptiles were the dominant animals. Even so, it was during this era that the first mammals appeared on Earth. The first mammals were small, and they probably stayed alive by keeping out of the dinosaurs' way.

Cold Front

About 65 million years ago, the Mesozoic era came to an abrupt end and life on Earth was virtually wiped out. Paleontologists believe this could have been caused by a meteor hitting Earth and severely changing its climate. Cold-blooded reptiles, whose body temperatures change with their surroundings, couldn't cope with the sudden climate shift. But warm-blooded mammals survived. This marked the start of the Cenozoic era, or the age of mammals.

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What do mammals need to survive at high altitudes?

THE STORY OF LIFE

1. Oxygen tanks
2. Woolly coats
3. Canine teeth

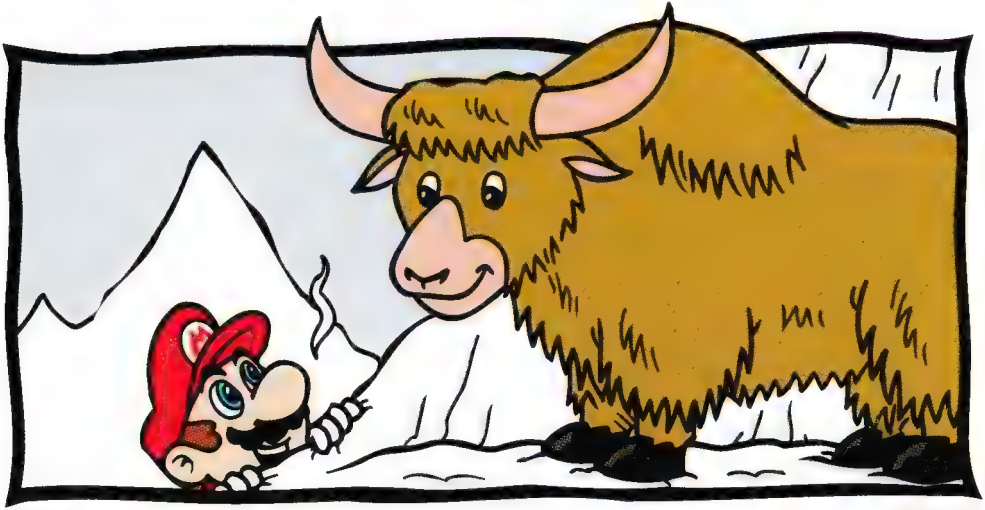

Illustration: Gary Fields

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Mountain Animals

A heavy coat of fur protects a mammal from the extreme cold and high winds of mountain environments.

2 Mammals that live at high altitudes need woolly coats.

© G. Lacz / Sunset

The thick-coated snow leopard lives in the highlands of China and the Himalayas.

Mammals such as the alpaca and chinchilla, which live in the Andes Mountains of South America, are prized for their fur. The hair of Angora goats, which live in the mountains of central Asia, is used to make mohair wool.

Slippery Slopes

Mammals that live in the mountains must be sure-footed. Mountain goats know how to step lightly on rocky mountainsides. The yak, a type of cattle native to the Himalayas of Tibet, has a limited range in the mountains. It's so big it can't travel over slippery, rugged terrain.

Insects and Others

Strong birds, like condors, live in high altitudes. Only the toughest birds can fly in harsh mountain winds. Cold-blooded reptiles are not found in mountains, but some insects are adapted to mountain life. Grylloblattids are wingless insects that live in the Rocky Mountains. They thrive in the cold and die in warm temperatures.

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Which teeth do herbivores use most?

THE STORY OF LIFE

1. Canines and incisors
2. Incisors and molars
3. Herbivores don't have teeth.

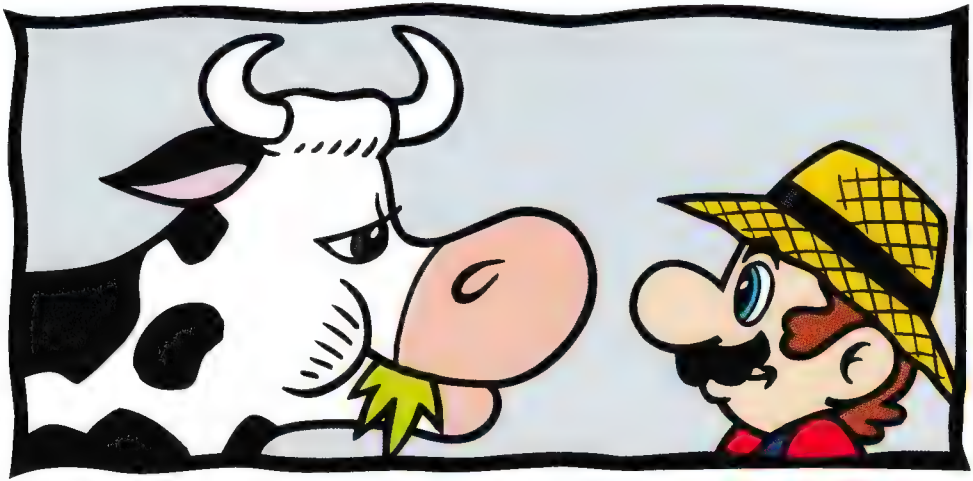

Illustration Gary Fields

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Mammal Teeth

Herbivores, animals that eat plants, use incisors to cut through food and molars to grind it.

2 Herbivores use incisors and molars.

© Len Sirman

Rabbits don't need sharp canine teeth to chew the grass and plants that comprise their diet.

Since herbivores don't eat meat, they don't use sharp, pointed canine teeth designed for tearing food. In fact, many herbivores don't have canine teeth. The ones that do, use them mainly for defense. Wild pigs, for example, have sharp tusks that protrude from their lower jaws. The tusks aren't much good for chewing, but they help the pig fight off its enemies.

Down in the Mouth

Horses and zebras use their upper and lower incisors, or front teeth, to clip grass and plants. They grind their food with their large molars, or cheek teeth. Camels, cows, and giraffes have lower, flatter cheek teeth for grinding food.

Rhinos use their tough, flexible lips to gather grass and plants into their mouths. African rhinos have no front teeth. Asian rhinos have incisors, and Sumatran rhinos have canine teeth that they use for fighting.

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What are prosimians?

THE STORY OF LIFE

1. Ancestors of primates
2. People who believe in one god
3. People with extremely high IQs

Illustration: Gary Fields

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Prosimians

The biological order of primates, called Primata, includes apes, monkeys, and humans. Scientists believe that primates descended from prosimians.

1 Prosimians are the ancestors of primates.

© M. Loup / Jacana

You can recognize a ring-tailed lemur by its striped tail. Ring-tailed lemurs are active during the day. Most prosimians are nocturnal.

The word prosimian means "before apes." Scientists agree that small, tree-dwelling prosimians lived on Earth before apes did. Some prosimians still exist. It's not hard to see their resemblance to apes and monkeys.

Shrews and More

Prosimians include lemurs, shrews, lorises, and tarsiers. All live in Southeast Asia, Africa, and on the island of Madagascar. Like primates, prosimians have long tails and hands and feet that grip. They usually live in trees and they dine mainly on leaves, fruit, insects, and small animals.

The Better to See With

You can recognize a prosimian by its huge eyes and ears. Since most prosimians are nocturnal—active mainly at night—they need excellent eyesight and hearing to help them move from branch to branch and to find food in the dark.

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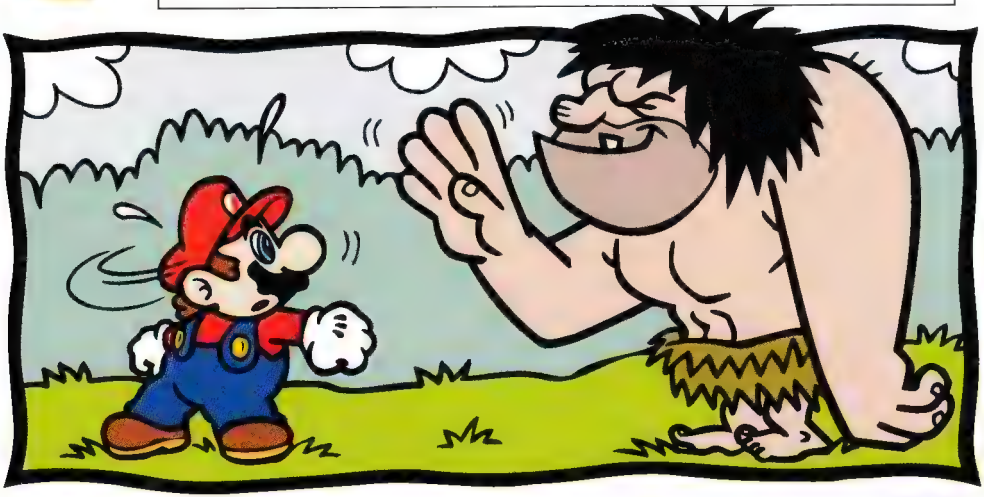
In anthropology, what is a missing link?

THE STORY OF LIFE

1. An extra vertebra in a human's spinal column
2. A primitive form of toad
3. A species that joins two groups of living things



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Missing Link

When paleontologists and anthropologists piece together a chain of evolution, they look for connections between different groups of life forms. These connections are missing links.

3 A missing link is a species that joins two groups of living things.

© R. Pratta / Icones / Explorer

Paleontologists are always looking for the missing link between humans and apes. It might have looked something like this model.

The animals we know today evolved from other earlier species. In each stage of evolution the creatures changed physically. Sometimes evolution produced entirely new species.

Paleontologists chart the evolution of life on Earth by studying fossils—the remains of animals and plants that have turned to rock over long periods of time. By determining the age of the fossil and examining its physical characteristics they can piece together an evolutionary chain of creatures.

Fill in the Blank

A missing link fills in a space on the chain by helping paleontologists connect two distinct groups of living things. One of the best known missing links is Archaeopteryx, a prehistoric fossil that combines physical characteristics of reptiles and birds. It's the earliest known bird fossil, and the missing link between reptiles and birds.

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Are there more vertebrates or invertebrates on Earth?

THE STORY OF LIFE

1 Vertebrates

2 Invertebrates

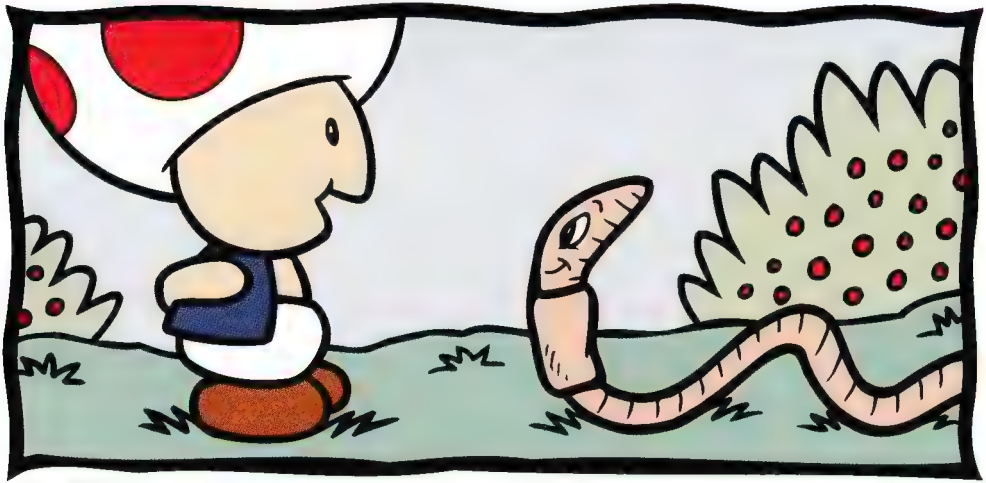

Illustration: Gary Fields

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Invertebrates

Animals without backbones are called invertebrates. They make up about 90% of all animals on Earth.

2 There are more invertebrates than vertebrates on Earth.

© NHPA / Sunset

Centipedes and millipedes are among Earth's many invertebrates—animals without backbones.

Humans and other mammals are vertebrates, or creatures with a backbone. Fish, reptiles, amphibians, and birds also are vertebrates. Just about every other creature on Earth is an invertebrate.

Underwater

Most invertebrates live underwater. Many, like the sea anemone, sponge, and coral, cling to rocks or the sea floor and rarely move. Others, like the octopus, crab, and lobster, can swim or walk around. They range in size from the squid, which can grow to be over 49 feet (15 m) long, to creatures like the hydra, which are barely visible to the naked eye.

On Land

Invertebrates are well-represented on land, too. All insects, from flies to caterpillars, are invertebrates. Arachnids, such as spiders and scorpions, and annelids, such as earthworms, are invertebrates as well. Over a million different types of invertebrates live on Earth.

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Can a wild animal's behavior be modified?

THE STORY OF LIFE

1. No, all animal behavior is instinctive.
2. Yes, some animal behavior is learned.

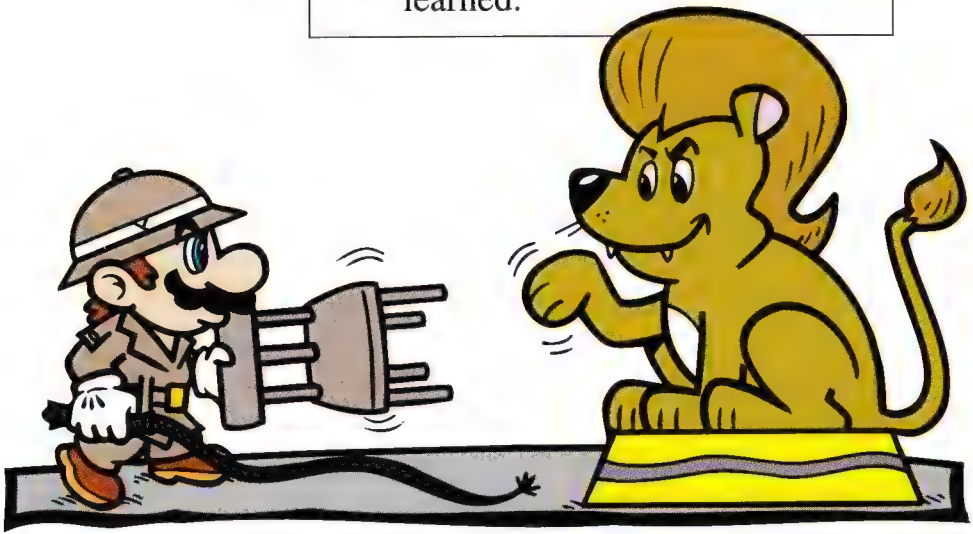

Illustration: Gary Fields

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Animal Behavior

Zoologists divide animal behavior into two categories: instinctive and learned. Instinct is skills and behavior an animal is born with. Other skills must be learned.

2 Some animal behavior is learned and can be modified.

© Collins / Sunset

Lion cubs have to be taught how to hunt for food. Hunting skills are learned behavior.

When baby kangaroos are born they're not fully formed, yet they instinctively crawl up the mother's belly to her pouch where they continue to develop. The babies don't know what they're doing—their brains aren't even fully developed—but they do it anyway. That's instinct.

Learning Curve

On the other hand, lion cubs aren't born knowing how to hunt. They learn the skill from their mothers. Bear cubs learn from their mothers how to dig dens and hibernate. If a young animal is orphaned or left alone, it doesn't learn behavior it needs to feed itself and survive.

In Montana, a group of biologists teaches orphaned bear cubs how to dig dens in which they hibernate during the winter. With the help of these human teachers, many of the orphaned cubs now survive in the wild.

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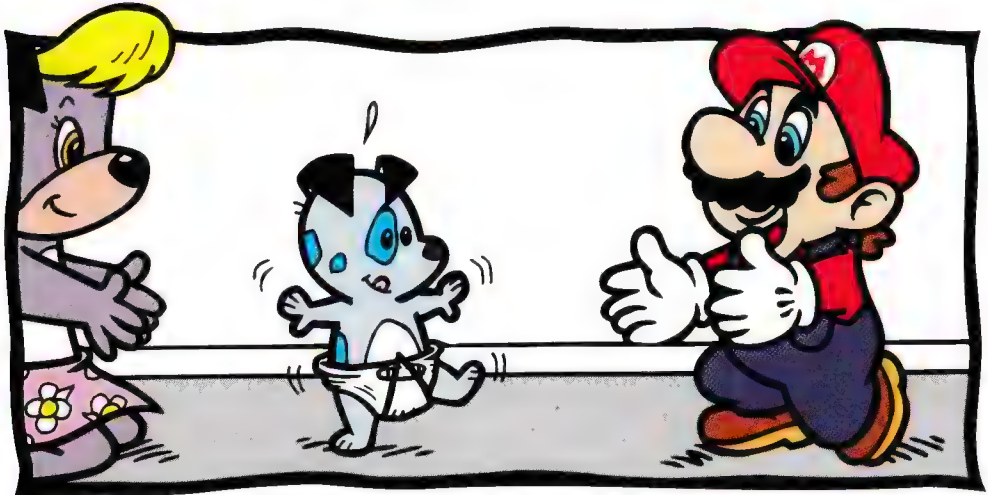
Which word is used to describe a baby who is just starting to walk?

THE STORY OF LIFE

1. Perambulator
2. Stroller
3. Toddler



Illustration, Gary Fields

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Toddlers

Babies generally take their first steps when they're about 12 to 16 months old. This is known as the toddler stage. To toddle means to walk unsteadily.

3 A toddler is a baby who is just learning to walk.

© Bouchardat, BSIP

Toddlers learn new things every day...like what happens when you stack a bunch of blocks, and then knock 'em down!

Toddlers love to investigate everything around them. This can be thrilling, but dangerous, since toddlers are too young to know that some things that look like fun can hurt them.

Terrible Twos

People sometimes refer to the ages between 18 months and 3 years as the "terrible twos" because kids of this age can be especially stubborn. Toddlers seem stubborn because they're making decisions for the first time. They're old enough to decide what they want to eat and which toys they like to play with, for example. They're also physically able to do new things, like running, climbing stairs and playing games. And they're able to express themselves by speaking. All these new achievements give toddlers a great sense of self-confidence. For a toddler, the "twos" aren't terrible, they're exciting.

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How much does a healthy newborn baby usually weigh?

THE STORY OF LIFE

1. 1 pound
2. 7 pounds
3. 15 pounds

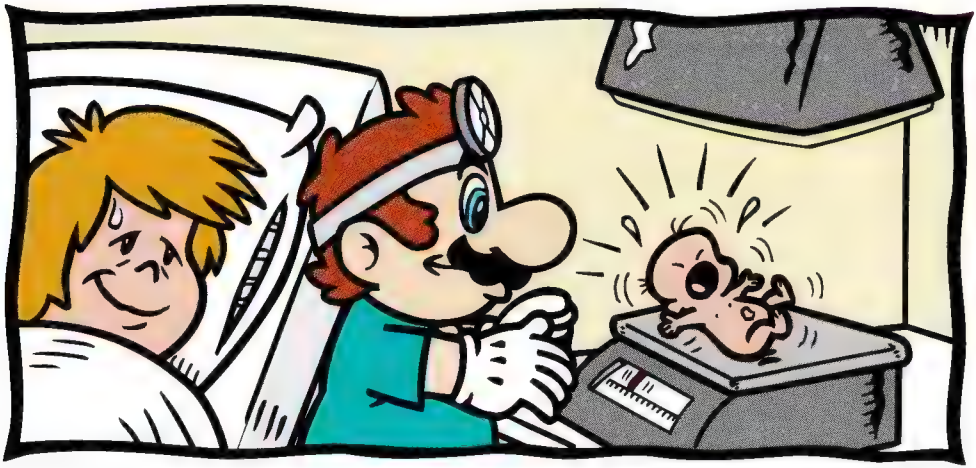

Illustration: Gary Fields

©1997 Nintendo

Infants

A newborn baby is called an infant. The word infant comes from Latin words meaning, "not speaking."

2 **A healthy newborn baby usually weighs about 7 pounds.**

© Leca / BSIP

Infants can't stand on a scale to be weighed, so a special infant scale weighs the baby in a flat position.

Infants don't speak, but they know how to make noise. They cry when they're hungry or uncomfortable. They gurgle when they're happy and content. Then, when they're a few months old, infants begin to laugh and make simple sounds.

Growing Up

Infants grow very quickly. In just five months, an infant will weigh double what he weighed at birth. To keep up that growth pace, infants eat often. A newborn baby may want to be fed as often as every two hours—that's at least eight meals a day!

After a few months, a baby eats less frequently, and that early growth spurt slows slightly. In one year, his birthweight will triple. At age two, kids weigh about four times what they weighed when they were born.

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What's the difference between a tickle and an itch?

THE STORY OF LIFE

1. A tickle moves; an itch stays in one place.
2. Everyone gets itches, but only kids can be tickled.
3. They are the same.

Illustration: Gary Fields

©1997 Nintendo

Tickling

Both tickles and itches are ways that your skin's pain receptors respond to irritation. An itch is generally concentrated in one spot, but a tickle can seem to travel over the skin.

1 A tickle moves, but an itch stays in one place.

© V. Clement / Jerrican

Tickling starts when the pain receptors in your skin are stimulated. Once your brain determines that you're not in danger, you laugh.

Doctors have found that even though tickling makes some people laugh, when you flinch or wriggle away from being tickled you're instinctively trying to avoid pain. The most ticklish areas on your body are your face, belly, and the soles of your feet. These also are the areas of the skin which contain the most pain receptors. When they're stimulated, your body prepares itself for the possibility of pain. Wriggling away is an involuntary protection mechanism.

Brain Power

Impulses from the skin receptors travel to the brain where they're sorted out. Your brain tells your body that it's not in danger, and so you laugh. In fact, your brain controls your body's reaction to tickling. If you're in a bad mood, tickling might not make you laugh. It might even make you cry!

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When do most kids learn to speak?

THE STORY OF LIFE

1 Age 1

2 Age 2

3 Age 3

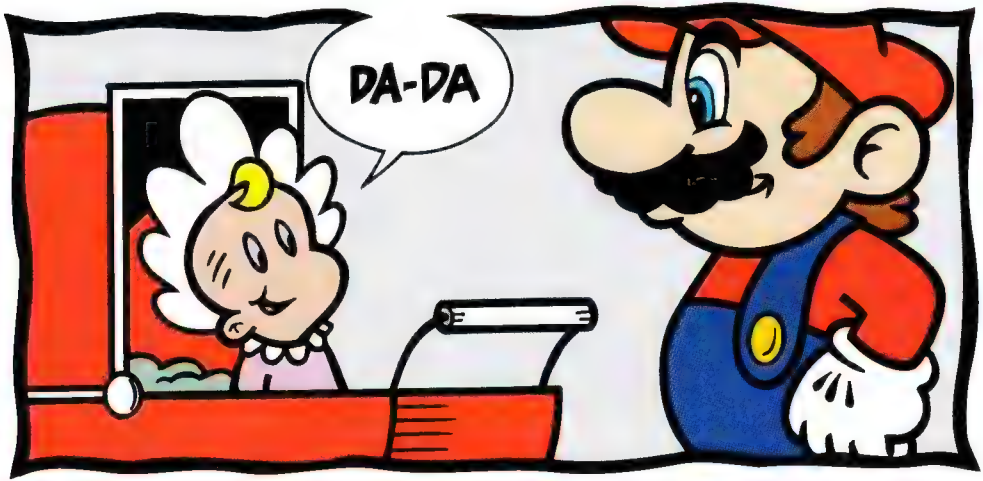

Illustration: Gary Fields

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Language

Even when they're a few months old babies make sounds, but doctors define speaking as using words that mean the same thing every time they are said.

1 Most kids learn to speak when they're about 1 year old.

© Gaillard / Jernican

Babies can make the sounds of every language on Earth. They learn to speak words by imitating the sounds that they hear. So, whether they learn to speak English, French (like these two boys), Chinese, or Swahili depends on what language they hear most often.

Babies can make all kinds of sounds. They make the sounds used in all of the languages spoken on Earth. They learn to convert those random sounds into words by repeating the combinations of sounds they hear most often. This means that babies learn to speak by listening to other people speak and repeating what they hear.

Learning Language

Put a baby in a room with a dog and a ball and the baby will want to investigate both of these exciting things. She'll point to the ball and say, "Ah!" Then she'll point to the dog and say "Ah!" But if each time she points to the ball you tell her it's a "ball," eventually she comes to associate the sound "ball" with that round object. At first the process is slow, but once a baby makes the association between a word sound and an object, her ability to learn new words increases quickly.

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Which is an ancestor of the elephant?

THE STORY OF LIFE

1. Aardvark
2. Mammoth
3. Rhinoceros

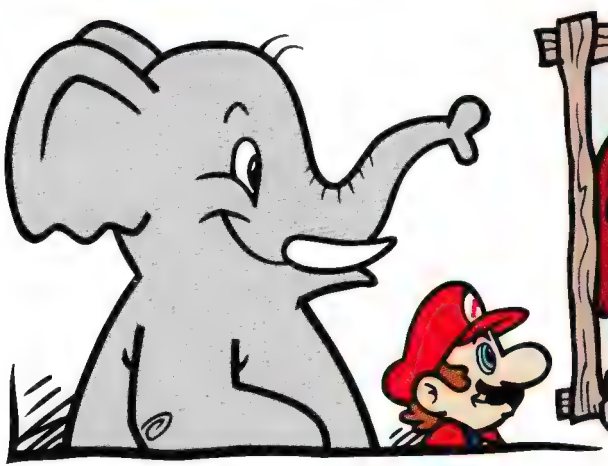

Illustration: Gary Fields

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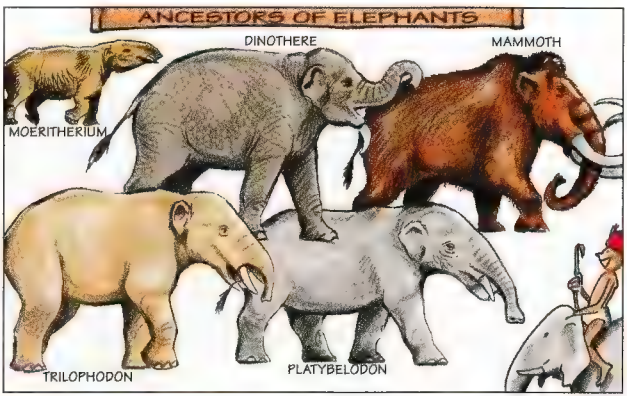
Mammoth

The mammoth looked like a big, hairy elephant with long curled tusks. It roamed Earth for the first time 2 million years ago.

2 A mammoth is an ancestor of the elephant.



The elephants we know today evolved from ancient creatures such as these.

Mammoths, particularly the species called the woolly mammoth, roamed all over North America. With several layers of fat topped by a double-thick coat of hair to insulate them from the cold, mammoths were suited for northern climates. They stood more than 14 feet (4 m) tall, and their curled tusks were about 16 feet (5 m) long. Paleontologists know a lot about mammoths because they have found mammoth carcasses that are almost completely intact. Some mammoths were trapped in glaciers more than 30,000 years ago. Their bodies have been frozen in time.

Other Early Elephants

Another elephant ancestor, the mastodon, lived about 25 million years ago. Mastodons looked like small mammoths. They stood about 10 feet (3 m) tall and their tusks were about 7 feet (2 m) long. Remains of mastodons have been unearthed in Ohio.

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What does the study of fossils tell us about?

THE STORY OF LIFE

1. Evolution of plants and animals
2. Earth's environment millions of years ago
3. Both

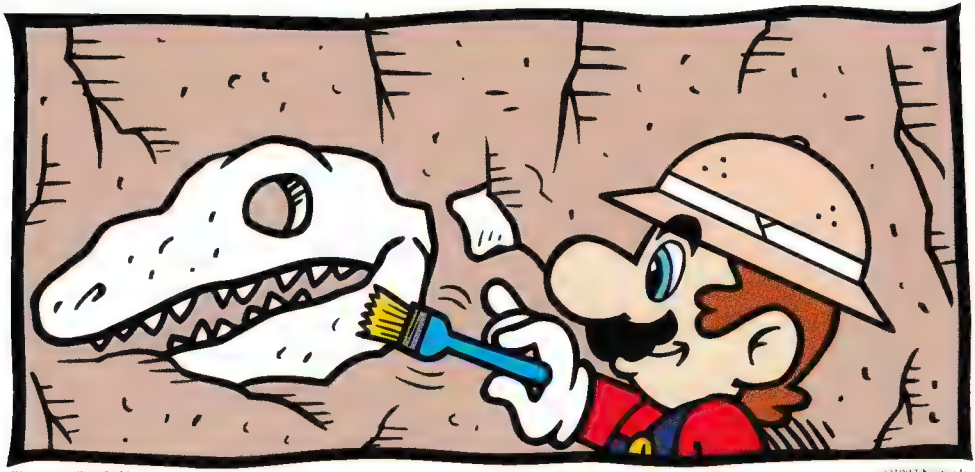

Illustration Gary Fields

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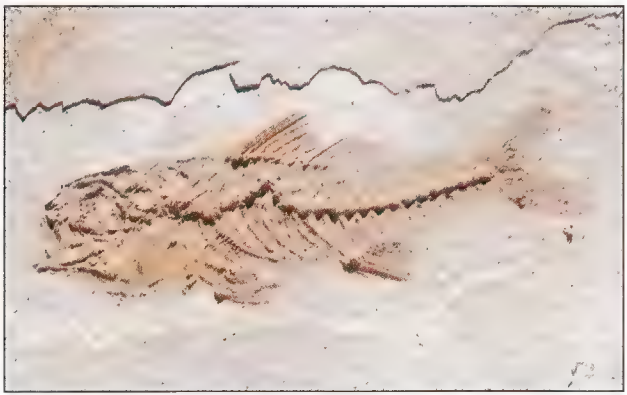
Fossils

A fossil is the remains of a plant or animal that have turned to rock over time.

3 **Studying fossils tells us about the evolution of plants and animals, and Earth's environment millions of years ago.**



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In this fossilized fish, the bones are easy to identify. By determining the age of the rock, paleontologists can tell how old the fossil is. The rock's mineral content provides clues about where and how it was formed.

Paleontologists only know about many prehistoric species of plants and animals from the fossilized remains they have found. Fossils are like records "set in stone" of the physical characteristics of these long-extinct species.

Set in Stone

Sometimes the plant or animal actually turns to stone. Usually this occurs only with the hard parts of an animal's body, such as bones and teeth. Over time, minerals in the soil become part of the structure of the bones.

In other cases, the plant or animal creates an imprint in the soft rock around it. Over time, the rock hardens and the imprint remains even though the plant or animal has long since decomposed. This is how most plant fossils are formed and it's also how fossilized dinosaur footprints were created.

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Which animal is an insectivore?

THE STORY OF LIFE

1. Goat
2. Lion
3. Mole

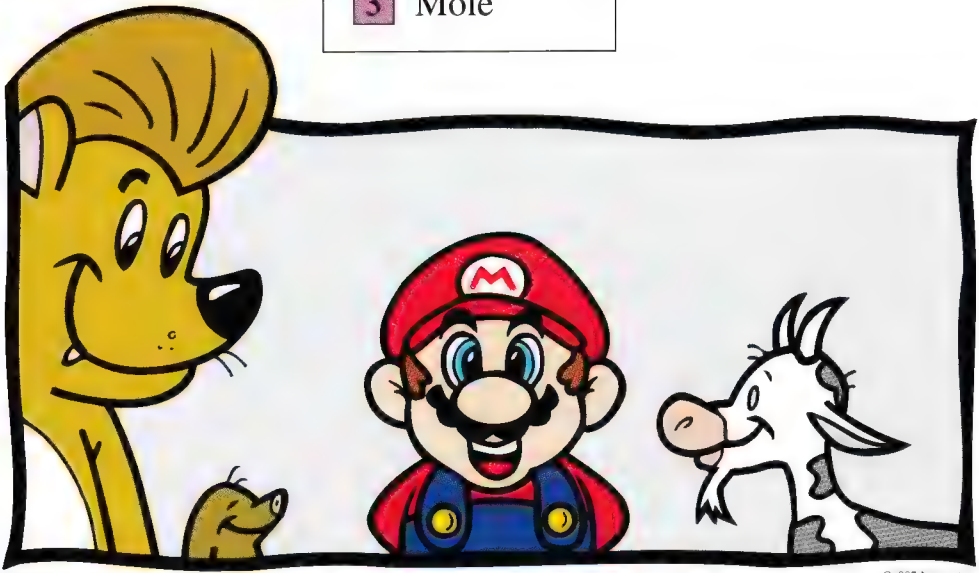

Illustration: Gary Fields

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Insectivore

An insectivore is a mammal that eats insects. The biological order *Insectivora* includes moles, shrews, and hedgehogs.

3 A mole is an insectivore.

© STF / Sunset

It's rare to find a mole above ground. They spend most of their time tunneling or burrowing under the soil and searching for earthworms to eat.

Moles are mammals that live underground in complete darkness. They burrow beneath the soil and live on a diet of earthworms and other invertebrates. Moles have eyes, but they're often covered by flaps of skin. In many cases, moles are completely blind. They navigate and find food underground by using their senses of smell and touch.

Bug Bites

We tend to think of birds, reptiles, and amphibians as being the only bug-eaters, but the order *Insectivora* includes about 350 species of mammals. These animals share some physical characteristics. They generally have poor eyesight. They have pointed snouts lined with prickly hairs that help them detect the movement of prey, and their teeth are tiny, pointed, and sharp—designed for grabbing and crushing insects.

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Which birds are members of the order *Psittaciformes*?

THE STORY OF LIFE

1. Parrots and parakeets
2. Robins and wrens
3. Ostriches and emus

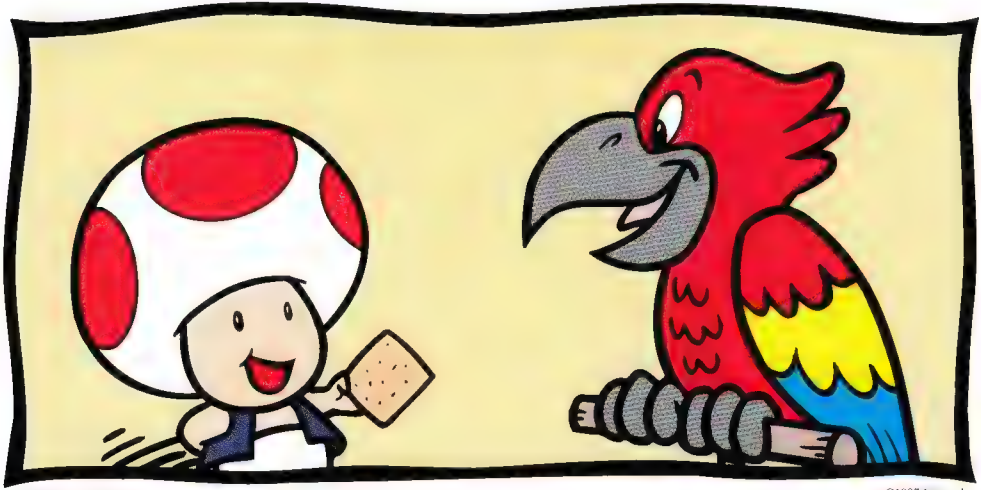

Illustration Gary Fields

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Psittaciformes

There are more than 300 species in the order *Psittaciformes*. They include parrots, parakeets, macaws, and cockatoos.

1 Parrots and parakeets are in the order *Psittaciformes*.

© G Lacz / Sunset

Members of the order *Psittaciformes* are known for their brilliant plumage—ranging from green to yellow to red and blue.

Parrots and their relatives are found mainly in the Southern Hemisphere, from Central and South America to Africa, Southeast Asia and Australia. At one time, the Carolina parakeet was the only species that lived in North America. Unfortunately, the species became extinct in the 20th century.

Polly Wants a Cracker

Records dating back to 400 BC tell of pet parrots that were trained to "talk." The first talking parrots spoke Greek and Indian languages. Ordinarily, a parrot's call is a harsh squawk. They don't sing, but they make a lot of noises.

Parrots learn to talk by mimicking sounds they hear. So, a parrot kept in captivity mimics the voices of the people around it.

Zoologists once thought parrots didn't understand the words they spoke. However, lab experiments have shown the birds can be trained to answer questions and identify objects.

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Which birds are members of the order Passeriformes?

THE STORY OF LIFE

1. Duck and mallard
2. Ostrich and emu
3. Sparrow and swallow

Illustration Gary Fields

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Passeriformes

This biological order is the largest of all orders of birds, encompassing about 5,000 species. About 4,000 of these are songbirds.

3 Sparrows and swallows are part of the order *Passeriformes.*

© NHPA / Sunset

Passerines are perching birds recognizable by their four-toed feet. Three toes face forward and one faces backward.

Passerines, or members of the order *Passeriformes,* are perching birds. They're identified by the structure of their feet. They have four toes—three facing forward and one facing backward—which allow them to grip tree branches and other surfaces for perching. Most passerines are small to medium-sized.

Whistle While You Work

Most passerines are known for their nest-building skill and their songs. Pairs of birds build nests by weaving them from twigs, reeds, and grasses; some pack them with mud.

Passerines such as canaries are prized as songbirds. An organ called the syrinx in the bird's throat lets it sing varied songs. Males usually sing a clearer, truer song. Male passerines also generally have more colorful feathers with distinct patterns.

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At what age do most babies first recognize their parents?

THE STORY OF LIFE

1. 2 months
2. 12 months
3. 18 months

Illustration: Gary Fields

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Recognition

Long before they can walk or talk, babies demonstrate an awareness of their surroundings.

1 Most babies can recognize their parents at about 2 months of age.

© Sirius / Sunset

Babies respond to their parents' faces and voices by smiling or making happy noises.

When a baby is about two months old, it begins to be able to focus its attention on the world around it. An infant can become fascinated by a mobile hanging over its crib or by a colorful picture on the wall.

Getting to Know You

At the same time, infants are learning to recognize familiar faces and sounds. These familiar things make the baby feel comfortable.

The people that make a baby feel most comfortable are the people that the baby knows best—usually its mother and father.

At two months of age, a baby is familiar enough with its mother's voice and face to respond to her when she's around. A baby usually shows its recognition by smiling or making a happy noise when it hears its mother's voice or sees her face.

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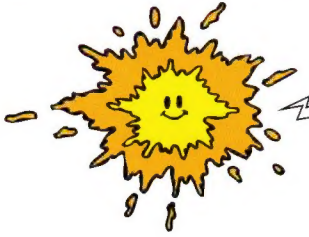
Who was Dian Fossey?

THE STORY OF LIFE



1. Chemist
2. Geneticist
3. Zoologist

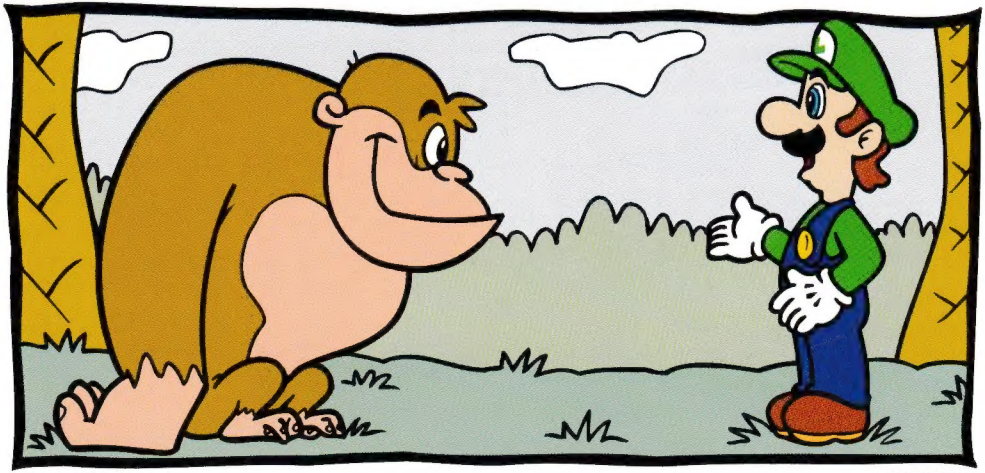


Illustration: Gary Fields

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Dian Fossey

In her book *Gorillas in the Mist,* Dian Fossey recounts her experiences living with and studying mountain gorillas in Rwanda.

3 Dian Fossey was a zoologist.

© Watkins / Sipa Press

American zoologist Dian Fossey conducted groundbreaking research on the lives and habits of African mountain gorillas.

Without the work of Dian Fossey (1932-1985), the rare mountain gorillas of east central African could be extinct today. Her interest in the gorillas began on a trip to Africa in 1963. She returned in 1966 to study the gorillas full-time.

Remote Rwanda

Hunters and poachers had almost wiped out the mountain gorillas. Those who survived retreated into remote areas in the Virunga Mountains of Rwanda.

Moving to the mountains and establishing the Karisoke Research Center, Fossey slowly gained the gorillas' trust. They became so comfortable with her that they sometimes visited her campsite.

Fossey worked hard to stop the illegal poaching that was wiping out the gorilla population. It was probably one of those poachers who murdered her while she slept at her camp in 1985.

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